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A new Panama Canal Co. is reported to have been formed in France with an initial capital of 60,000,000 francs ($12,000,000), which proposes to resume work on the canal at once. It will be remembered that the liquidators or receivers of the original company succeeded in securing from the Colombian Government an extension of the concessions, which expired in 1892, until October, 1894, and it is the purpose of the present company to begin work before this expires. The peculiar manner in which the capital of the new company has been raised, however, does not inspire much confidence in its professions to resume work. If the dispatches to American newspapers are true, the larger part of the 60,000,000 francs has been subscribed by the bankers, contractors and others who are alleged to have filched money from the original company, and have been compelled by threats of legal proceedings to make restitution in this manner.

The Nicaragua Canal bill which has been submitted to the House Committee on Interstate and Foreign Commerce by Representative Mallory, of Florida, as noted in our last issue, provides for an issue of $83,000,000 of stocks, 830,000 shares of $100 each. Of this amount the United States is to have $70,000,000 and $1,000,000 is to be given the canal company for concessions, leaving $12,000,000 to be subsequently arranged for. There are to be eleven directors, eight representing the United States, one for the canal company, one for Nicaragua and one for Costa Rica. The United States directors are to be appointed by the President. Two directors will be elected for two years and be eligible for re-election for four years, three will be elected for four years, and three for six years. The president of the board will receive $6,000 per annum under this plan, the other directors $5,000. Three engineers of the army, selected by the President, will have charge of the work, to receive 25% more than their salaries. They are to be compensated by the company. Bonds are to run until July 1, 1904, bearing interest at 3%, and may be called in at the pleasure of the Secretary of the Treasury after July 1, 1904. Dividends are not to exceed 5% on the stock.

A classified summary of the receipts and expenditures of the national, state and local governments of the United States is given in Extra Census Bulletin No. 70 by states and groups of states. The main summary for the United States is as follows, all expenditures for public schools being combined in one item:

	Revenues.	Expenditures.
National, inc. postal service.	$461,154,680	$352,218,614
States, terrs. and Dist. Col.	116,157,640	77,105,911
Counties, partly estimated..	133,525,493	114,575,401
Municipalities, partly estim'd	329,635,200	232,988,592
Public schools.....	.....	139,065,537
Total	$1,040,473,013	$915,954,055

The mileage of new railway line constructed in the United States during the first six months of 1894, according to statistics collected by the "Railroad Gazette," is only 495 miles, or about one-half the mileage built during the same period of 1893. No state has built 100 miles of line, and only one state has built over 50 miles. This is South Carolina, which has built 54 miles. The new mileage by states is given as follows:

Arizona	23	Missouri	6
Arkansas	19	New Jersey	35
California	18	New York	2
Colorado	48	Ohio	43
Florida	50	Pennsylvania	39
Georgia	8	South Carolina	54
Illinois	4	Texas	15
Louisiana	36	Virginia	3
Michigan	6	West Virginia	27
Minnesota	5	Wisconsin	24
Wyoming	20	Total	495

The most serious railway accident of the week was the derailment of a passenger train on the Canadian Pacific Ry. near Greenville, Me., July 2, in which five persons were killed and six injured. The accident occurred on an embankment 20 ft. high, and was caused by a tie laid across the rails.——A freight train on the Baltimore & Ohio R. R. broke in two on a high trestle at Walnut Creek, O., June 24. The two sections collided and two cars went over the trestle, falling 50 ft. Three men were killed and three more were fatally injured.

A trestle at Nigger Hill, near Pine Bluff, Ark., on the St. Louis Southwestern Ry. gave way under a freight train July 1, and the engine and 28 cars went down. Two men were killed. The trestle was on fire at the time.——A trestle on the Canadian Pacific Ry. near Harvey, N. B., gave way under a train June 29, and the mail and passenger cars went down. One person was fatally injured.

Several derailments and minor wrecks have been caused by the strikers on Western roads placing obstructions on the tracks and misplacing switches.

A test of machine guns is being made by the navy department to determine the adaptability of the various kinds to naval purposes. Seven different guns have been submitted for the tests, five of which are multi-barrel guns and two single-barrel guns. All of the guns are of well known types except one of the single-barrel guns known as the Skoda, which is stated to be the invention of an Austrian army officer. Like the Maxim gun its action is automatic, the recoil from one explosion discharging the following cartridge. Its rapidity of fire is stated to be 500 shots per minute.

The Tower Bridge across the Thames River at London, England, which has been under construction since March, 1886, was formally opened for traffic by the Prince of Wales, June 30. This structure was fully described in our issue of Jan. 18, 1894.

The improvement of Seattle Harbor, and the construction of a ship canal connecting it with Lake Washington are now being agitated by the business men of Seattle, Wash. At a mass meeting recently held it was voted to urge the State Land Commission to adopt the plans for this work which had been submitted by Capt. T. W. Symons, U. S. Engineer Corps. In brief, this plan provides for a ship canal with locks at tidewater running from the head of the bay to Lake Washington; the extension of the harbor, with the addition of slips, waterways and docks and the reclamation of the tidal flats for manufacturing and business purposes. The total cost of the work is estimated at $5,000,000.

A survey of the arid lands of the West is provided for in a bill just introduced into the House of Representatives, and supported by the members from the Western states. The bill provides that the government shall make surveys of all arid lands, with a view of determining the feasibility and cost of irrigating them, and prepare maps showing the necessary ditches, canals and reservoirs. The sum of $325,000 is to be appropriated for making these surveys.

More infringement suits against parties using mechanical filters are to be brought by the New York Filter Co., which, as we announced last week, has secured a decision from the U. S. Circuit Court sustaining its patent for the use of a coagulant in connection with rapid filtration. This particular decision was against the O. H. Jewell Filter Co., of Chicago, but in case it is sustained by the U. S. Court of Appeals it is said that none of the mechanical filter companies, except the New York, will be able to use alum, sulphate of alumina, or any other coagulant. The further suits will be against infringements of certain mechanical devices used in filtration and have been begun by a suit against the borough of Asbury Park, N. J., which recently contracted with the Continental Filter Co., of New York, for a mechanical filtration plant. The New York Filter Co. is the result of the consolidation of five separate filter companies or interests, is said to control over 100 patents relating to mechanical filters and has apparently set out to secure a monopoly of the mechanical filtration business in this country. There are still quite a number of companies in the business, however, some of which appear to be strong in every way, so that the struggle bids fair to be well contested.

The asphaltum deposits of Chickasaw county, Indian Territory, or more properly Oklahoma, are being developed by a company which proposes to put both the liquid asphaltum and the bituminous sand on the market. Several shafts, varying from 15 ft. to 42 ft. in depth, have been sunk, and, according to the newspaper reports, none of these has penetrated through the bed. According to the same reports, the beds seem to consist of a layer of the asphaltic sand overlying a bed of viscid bitumen, which is very sticky and difficult to extract. Chemical analysis shows the composition of this viscid bitumen to be as follows:

Carbon	55 %
Hydrogen	10.21 "
Oxygen	7.14 "
Nitrogen	2.74 "
Silicate and ashes	24.91 "

The percentage of earthy matter in the well-known Trinidad asphaltum in its crude state varies from 30 to 35%. It is stated that the Oklahoma company can put crude asphaltum, or asphaltic sand, on the cars for $8 per ton, and the liquid asphaltum for $17 per ton. Mr. G. F. Devereaux, of Oklahoma City, Oklahoma, is stated to be interested in the company working the deposits.

A new rapid transit bill for Boston has been passed by the legislature and has received the Governor's signature. The text of the bill is not at hand, but we believe that it provides for the construction of both an elevated railway system and the proposed Tremont St. subway.

In the pending naval appropriation bill an amendment has been proposed by Senator Hoar appropriating $60,000 for the production and test of a 10-in. high-power, wire-wound rifle, adapted to the naval service.

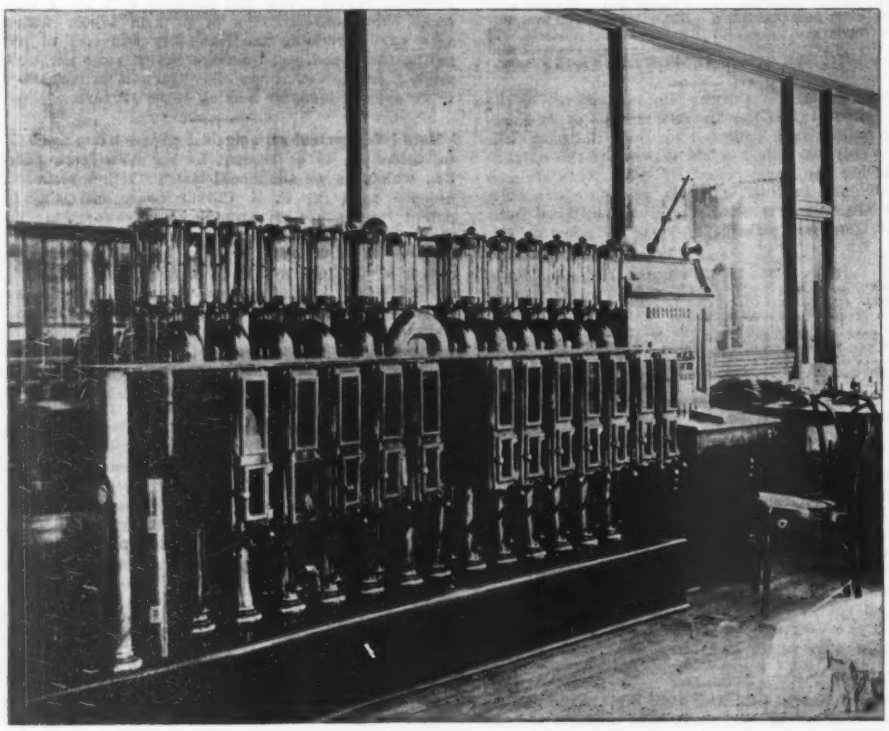
THE PNEUMATIC TUBE SYSTEM OF THE CITY PRESS ASSOCIATION OF CHICAGO.

By W. L. Stebbings, Chief Engineer.

(With Inset.)

The possibilities of the pneumatic tube system for conveying mail matter, telegraph messages, etc., have been quite carefully investigated in recent years, and several such systems are in operation in foreign countries, with almost universal success. In this country there has been but little experience in the construction and operation of pneumatic tube systems, although they have been much discussed in connection with the post offices of nearly all of our larger cities, and in 1892 such a system was built in Philadelphia. The Philadelphia system has proved unusually successful, and it is to be largely extended for commercial service as well as postal service. A second and in some respects more interesting system has recently been put in operation by the City Press Association of Chicago.

For some time the transmission of Associated Press despatches and other news items from the office of the Western Union Telegraph Co. to the various newspaper offices by messenger boys had been so unsatisfactory that general complaint had arisen. Messages now requiring one minute to deliver were often delayed half an hour, and sometimes were lost



PNEUMATIC TUBE SYSTEM OF THE CHICAGO PRESS ASSOCIATION; RECEIVING AND TRANSMITTING BOXES, WESTERN UNION BUILDING.

entirely. Expensive delays were thereby caused, and papers were sometimes compelled to go to press without important news which their contemporaries had printed, but of which they had been deprived by the caprice of some heedless messenger.

The dissatisfaction with the service finally became so great that Mr. Chas. H. Wilson, of the firm of Wilson & Jackson, general contractors, Monadnock Block, Chicago, proposed to construct a pneumatic tube transfer system on the same general plan as has been executed. Mr. Wilson, as Superintendent of the Chicago Telephone Co., had become thoroughly acquainted with "Underground Chicago," so far as the location of a large number of its pipes were concerned, and his proposition immediately attracted the attention of the City Press Association, which delegated Mr. Addison C. Thomas to investigate the proposition in its behalf. Mr. Thomas familiarized himself with the subject, with a view to constructing the best and most thorough system of pneumatic tubes obtainable, and finally recommended the system proposed by Mr. Wilson, and described and illustrated herewith. Arrangements were completed between Messrs. Wilson & Jackson and the City Press Association, and work was begun late in April, 1893.

The system extends from the Western Union Building on Jackson St. east to Clark St., where it turns north and runs to Washington St., branching off at Monroe St. to reach the offices of the "Evening Journal," "Tribune" and "Inter-Ocean." At Washington St. it runs west to Fifth Ave., branching off at various points to connect with the city hall and the offices of the "Herald," "Post," "Staats-Zeitung" and "Times," and thence south on Fifth Ave. to connect with the "Mail," "News," "Record" and "Dispatch." The aggregate length of tubes laid is slightly less than 15 miles. The plan provides one transmitting and one receiving tube for each subscriber, who supplies his own steam to exhaust the air before the carrier, which is hurried to its destination by atmospheric pressure. By adopting this method no complaint is likely to arise on account of poor service, and, besides, the simplicity of the vacuum system rendered it particularly fit for the conditions found. The injector used to exhaust the air before the carrier has a 3-16-in. opening, and maintains the proper circulation with a steam pressure of from 60 to 80 lbs., depending upon the length of the circuit operated.

The plan as at first outlined was to lay 29 lines of vitrified tile pipe, breaking joints longitudinally. These conduits were practically 5¼ ins. square on the outside and 4¼ ins. in diameter on the inside. The joints averaged ¼ in. in thickness, and the pipes were laid with a mandril.

The trench was excavated to the grade prescribed by the engineer, which was 6 ins. below the bottom of the lowest duct. Upon reaching this level, the bottom and sides were trimmed off to correspond with the engineer's drawings. Wherever any excavation extended below the grade called for, the trench was brought to the proper grade in every instance, by filling in with concrete, the use of earth for this purpose being prohibited. After the completion of the excavation, the bottom of the trench was covered with a uniform layer of concrete, composed of 1 part Portland cement, 3 parts torpedo sand and 5 parts broken stone capable of passing through a 1½-in. ring.

The materials used in this concrete were the best of their kind. Care was exercised in mixing, and the concrete was thoroughly rammed in place and brought to the grade required by the engineer. Work was prosecuted night and day. The trench was opened about one block ahead of the concrete work, in order to permit the engineer to change his grades in case any unexpected difficulty should occur. After assuring himself that his plan was feasible, or making such changes as were necessary, the engineer set grade stakes 10 ft. apart along the transit line. The top of these stakes coincided with the bottom of the lowest duct. The concrete was then put in and rammed until it showed just a sufficient amount of water to sweat on the surface, and the pipelayers followed as closely as was possible, without injuring the setting of the concrete by tramping upon it.

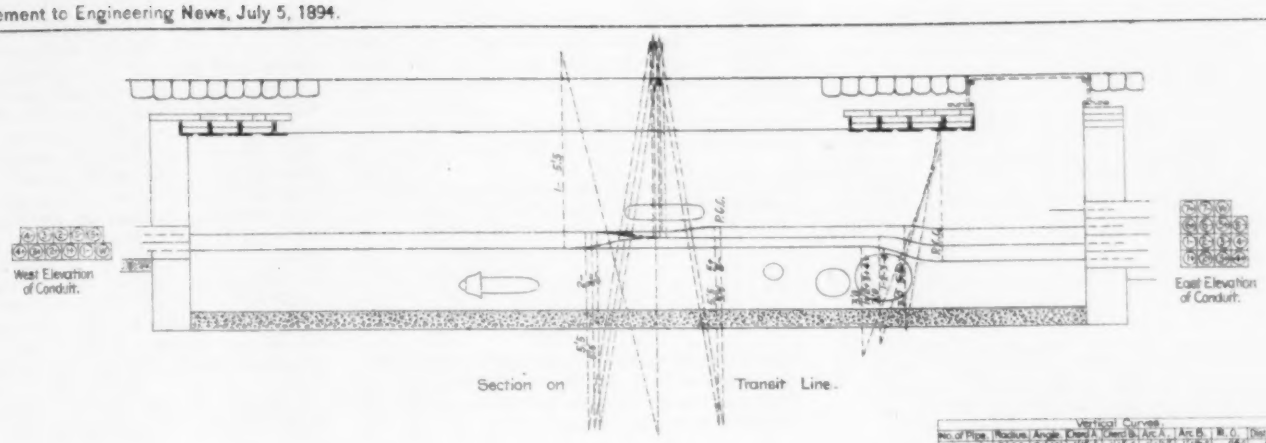
The conduit pipes were laid in cement mortar, composed of 1 part of Utica cement to 3 parts of torpedo sand. The sections were made to break joint in every direction, so that each joint was surrounded on all sides by a continuous section of pipe or a bed of concrete. Great care was exercised to get the pipes in exact line, so that no difficulty might be experienced in feeding the brass tubes, and after drawing out the mandrils the inside of the pipes were carefully cleaned, to prevent any lodgment of cement mortar, which might have been forced through the joints. Wherever necessary, the joints were wrapped with burlap, to prevent the cement from entering the pipes.

As fast as the conduit was completed the spaces between the sides of the subway and the sides of the trench were filled with Portland cement concrete, as described above. Both sides were filled simultaneously, and the concrete rammed in layers of 3 ins. or 4 ins. in thickness. On reaching the top of the pipes a layer of concrete 6 ins. thick was similarly rammed in place on top of the ducts, and the trench refilled to the paving level. The balance of the work was done to the satisfaction of the Department of Public Works of the city of Chicago.

Wherever curves were necessary to avoid an obstruction, vaults were constructed, having 13-in. brick walls and concrete bottoms; and in several instances, where there was insufficient room to lay the conduits, 4-in. iron pipes were put in, through which the brass pipes were fed. A reference to the drawings on the inset sheet shows clearly the complicated character of some of the curves required at places, and their arrangement in the vaults.

The process of determining the size and shape of a vault was as follows: As soon as it was perceived that curves could not be avoided in any locality, the location and dimension of all obstructions were actually taken and plotted to a scale of 1 in. to the foot, and the series of curves necessary to avoid the obstruction was plotted graphically. The pencil sketch was then taken onto the ground, and if, after the second examination, it was found that all obstructions had been removed or avoided, the vault was staked out in accordance with the preliminary sketch, which was then returned to the office, where the curves were accurately figured and plotted. Quite often the obstructions were of such a nature that the order of the pipes had to be changed. For example, the number of pipes in a vertical tier might be decreased and the number of pipes in a horizontal tier might be increased, or vice versa. A case of this kind is shown in the plan and section of the vault at the corner of Washington St. and Fifth Ave., where the four pipes for the "Staats Zeitung" building branch off, and again in the vault at the southeast corner of the same streets. It is evident that to make this transformation within a reasonable distance without interference of curves is a matter requiring care, particularly when the pipes are only 5½ ins. apart and lie in clusters of one or two dozen, or more.

A reference to the drawings will indicate the general features of the construction of the vaults. The roof was composed of 4 x 4-in. T's, between and upon which brick were laid, and upon the completion of the vault a suitable manhole frame and perforated cover were so located as to render the vault easily accessible. Some vaults, called "feed vaults" were built of such a length that the brass pipes might be fed through them into the conduits, and, in some instances, when the vaults had to be so shallow as to prevent feeding the pipes through the manhole, iron pipes were built in an inclined direction from the roof of the vault and terminated just below the pavement, where they were properly capped to prevent the entrance of earth. After all these details had been carried out, the earth was thoroughly tamped around the walls and top and puddled wherever necessary, and the pavement restored, as described above. Each vault was



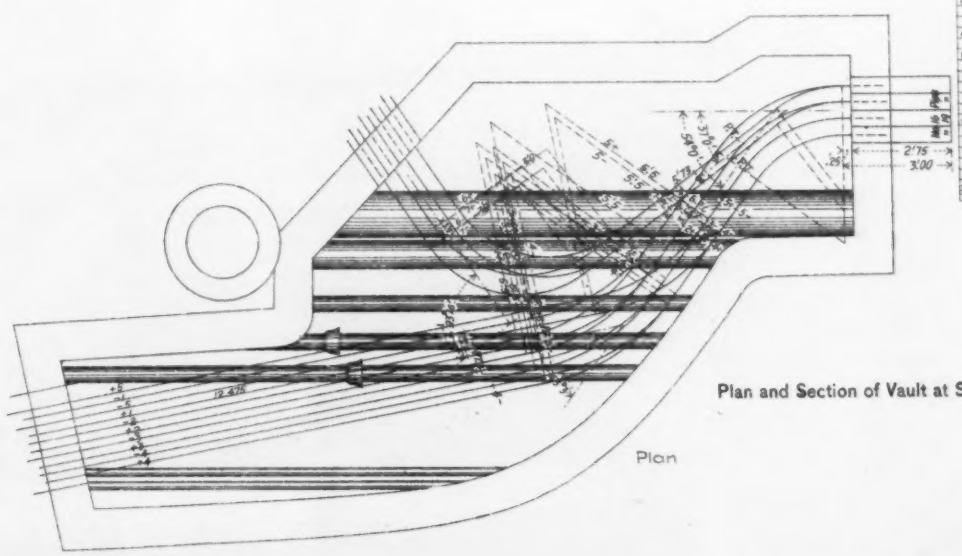
Vertical Curves.

No. of Pipes	Radius	Angle	Chord A	Chord B	Arc A	Arc B	B. O.	Dist. A	Dist. B
1+2+3+4+	3'0"	22°48'	1'-0"	1'-0"	1'-0"	1'-0"	0"	3"	1'-0"
1-5-6-	"	45°00'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
2-5+	"	45°00'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
1-	8'0"	11°15'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
1-2-3-4-	"	45°00'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
2-6+	"	11°44'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
5-6+7-7+	"	11°44'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
5-6+	3'0"	45°00'	1'-4"	1'-4"	1'-4"	1'-4"	0"	3"	1'-0"
7-7+	"	45°00'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
6-6-	"	45°00'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"
7-7-	"	45°00'	1'-5"	1'-5"	1'-6"	1'-6"	0"	3"	1'-0"

Horizontal Curves.

6-6+7-7+	3'0"	37°00'	1'-9"		1'-11"		0"	3"	1'-0"
4-4+5-5+	"	34°00'	1'-7"		1'-9"		0"	3"	1'-0"
1-3+2-6+	3'0"	"	1'-7"		1'-9"		0"	3"	1'-0"
2-5+	3'0"	"	1'-7"		1'-9"		0"	3"	1'-0"
1-1+	4'6"	"	2'-4"		2'-7"		0"	3"	1'-0"
6-6+7-7+	3'0"	37°00'	1'-9"		1'-11"		0"	3"	1'-0"
5-5+6-6+	3'0"	37°00'	1'-9"		1'-11"		0"	3"	1'-0"

Table of Dimensions of Curves.



Plan and Section of Vault at Southeast Corner of Washington St. and Fifth Ave.

Elevation.
Section at North Wall W. Union Building, Looking North.
Plan.
Plan and Section of Vault at Entrance to Western Union Building.

Table of Curves in Vault.

No. of Curve	No. of Tubes	Radius	Ang. A	Ang. B	Arc A	Arc B	Chord A	Chord B	D	L
1st	All except 13+15-	3'0"	90°00'		4'8⅝"		4'5⅞"			
"	11+11-	"	45°00'		2'4⅜"		2'3⅛"			
2nd	"	"	45°00'		2'4⅜"		2'3⅛"			
3rd & 4th	11+	"	36°14'	5°15"	1'10⅝"	0"	1'10⅜"	1'7⅜"	10⅝"	1'4⅞"
"	11-	"	33°44'	28°59"	1'9⅝"	1'6⅜"	1'9⅜"	1'5⅞"	0"	1'5⅞"
"	13+	"	39°27'	29°59"	1'10⅝"	1'6⅜"	1'10⅜"	1'6⅞"	0"	1'5⅞"
"	13-	"	33°29'	17°29"	1'9⅝"	1'4⅝"	1'9⅜"	1'3⅞"	3⅜"	2'4⅝"
"	14+	"	45°2'	30°2"	2'4⅜"	1'6⅜"	2'3⅛"	1'5⅞"	1'0⅝"	3'0⅝"
"	14-	"	37°2'	21°2"	1'11⅝"	1'1⅝"	1'11⅜"	1'1⅛"	4⅜"	2'4⅝"
"	11+	"	19°17'	19°17"	1'0⅝"	1'0⅝"	1'0⅜"	1'0⅜"	0"	1'10⅝"
5th	13-11+15+13+14+	"	90°00'		4'8⅝"		4'5⅞"			
"	11-	"	45°00'		2'4⅜"		2'3⅛"			
"	12-14-	5'6"	17°10"		1'7⅝"		1'7½"			
"	12+13+15+16+17+18+	"	90°00'		8'7⅛"		7'8⅝"			
6th & 7th	11+11-12+13-12-	3'0"	90°00'	180°00'	4'8⅝"	9'5⅛"	4'5⅞"	7'0⅝"	8"	12'6⅜"
"	14-	3'0"	37°00'	127°00'	1'11⅝"	3'9⅝"	1'11⅜"	3'4⅜"	8"	8'9"

Table of Curves in Building.

No. of Curve	No. of Tubes	Radius	Ang. A	Ang. B	Arc A	Arc B	Chord A	Chord B	D	L
6th & 7th	11+11-12+13-12-	3'0"	90°00'	180°00'	4'8⅝"	9'5⅛"	4'5⅞"	7'0⅝"	8"	12'6⅜"
"	14+15+16+17+18+19+	"	90°00'		4'8⅝"		4'5⅞"			
"	13-15-16-14-	"	90°00'	90°00'	4'8⅝"	4'8⅝"	4'5⅞"	4'5⅞"	11⅛"	9'4⅛"
"	12-13-14-15-16-17-	"	90°00'	90°00'	4'8⅝"	4'8⅝"	4'5⅞"	4'5⅞"	11⅛"	9'4⅛"
8th & 9th Curves	11+	2'9"	19°17'		1'0⅝"		1'0⅜"			

Table of Curves in Building.

The Pneumatic Tube System of the Chicago Press Association.

W. L. Stebbings, Chief Engineer. Wilson & Jackson, Contractors.

SHAR. HART & SONS, LITH., 24 VESEY ST., N. Y.

The Pneumatic Tube System of the Chicago Press Association

Inner and section of main as Erected to Harrison Street Station

so arranged as to drain through a small catch basin and a 6-in. pipe into the nearest sewer.

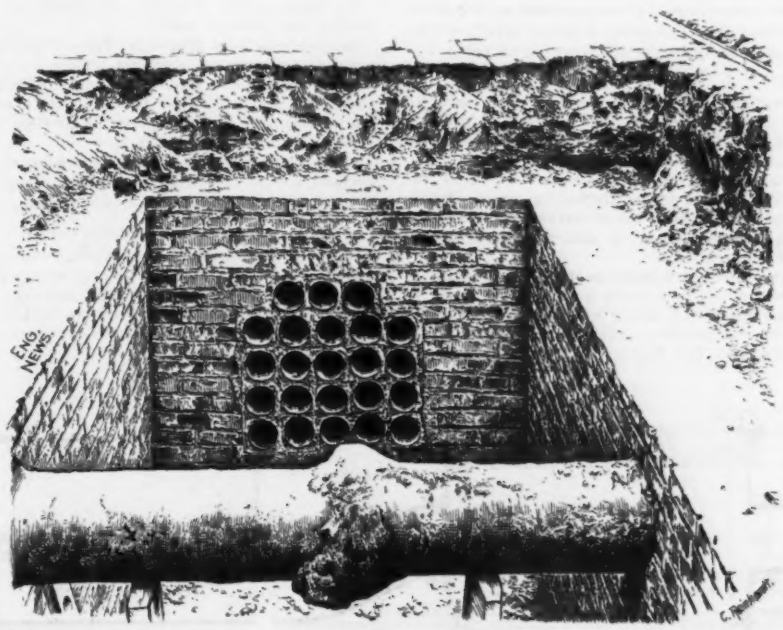
Before the completion of the vault the preliminary drawings had been completed and checked, the curves rectified and the order for the brass tubes made out and delivered. This tubing was 2⅞-in. seamless drawn brass tubing, made by the American Tube Works, of Boston, Mass., and ordered through Mr. J. Whitcomb Cotton, their Chicago representative. The pipes for the tangents generally were ordered in 20-ft. lengths, except at P. C., where exact lengths were given, as well as for the curves and short tangents in the vaults. No. 16 pipe was used in the vaults and No. 19 in the conduits. The No. 16 pipe to be used for curves was annealed at the works and bent in Chicago by Mathis Bros., 1445 State St., who had entire charge of the brass work of the system.

The carriers are the invention of Mr. J. H. Burbank, and consist of a spiral spring, covered with thin leather so as to be flexible transversely. The ends of the carriers are of cork, covered with leather, and the hinged end is fastened with a strap, in which is inserted an ordinary glove fastener. A ring of sheepskin, with the wool outside, is placed at each end of the carrier to prevent the passage of air. The transmission boxes are also the invention of Mr. Burbank and are a novelty in their line.

The accompanying cut shows the receiving and transmitting boxes in the Western Union Building, from a photograph taken by Stadler & Dovale. The receiving boxes are shown below and the transmission boxes above the horizontal plate. A telephone connecting with the various newspaper offices is shown on the extreme right. When thrown out of use caps, shown lying on the shelf at the extreme left, are placed in the upper end of the transmitting boxes, as shown in the right hand half of the system. A message to be sent as inclosed in a carrier is shown lying on the box to the extreme left, and the carrier placed in the transmitting box is shown in the second box from the left. Taking hold of the brass handle directly in front of the glass cylinder, the operator pushes the box into the position shown upon the extreme left and the carrier drops by gravity until past the vertical curve, when the vacuum in front of it hurries it to its destination. After the carrier has started, the box is pulled back to its original position and the circulation is impeded no further. The air in the receiving boxes is below atmospheric pressure and in consequence the doors are tightly closed. The carriers are received by this station upward through the forward pipes and thrown by a deflector into the receiving box. The air is cut off by pushing down the lever shown below the second box from the left, the door opened and the carrier taken out. Normally the doors are closed and locked and the vacuum in the receiving box is maintained by keeping the levers in the position shown upon the right.

The section of tube on the left was placed within view to show how a joint on a tangent was made.

As before stated, the work of construction began about May 1, 1893, and everything was finished, except for some minor changes, Jan. 1, 1894. Since its completion the system has been in continuous operation.



VIEW OF VAULT AT SOUTHWEST CORNER OF CLARK AND WASHINGTON STREETS, CHICAGO PNEUMATIC TUBE SYSTEM.

THE INTERNATIONAL RAILWAY CONGRESS, 1895.

One of the most important purposes of engineering associations is to promote and encourage the interchange and dissemination of knowledge and experience, thus broadening the minds of the members and tending to the improvement and growth of the profession and to the prosperity of the country to an extent that could not be attained if each man worked along in his own little circle without the means of knowing what other men were doing or had done. Almost every country has now its engineering societies, but international associations are few (except in so far as many leading societies admit foreign members) and it is easy to see why this is so, as the difference in language, temperament and practice, and the difficulties of attending meetings, act as very decided bars to any general movement of this kind. Nevertheless there are certain international associations devoted to specific subjects, such as the International Congress of Inland Navigation (in whose meetings the American Society of Civil Engineers has participated) and the International Railway Congress, and it is desirable that the attention of railway engineers, managers and their executive officers should be called to the meeting of the latter association which is to be held in London in 1895.

The International Railway Congress is an association composed of railway administrations, including railways owned by governments and by private companies. It was organized at Brussels in 1885, and has since then held meetings at Milan, in 1887, at Paris in 1889, and at St. Petersburg in 1892. The next and fifth meeting will be held at London in June, 1895, and as this will be the first meeting held in an English-speaking country it is desired especially to have a large representation of railway engineers and officers from all English-speaking countries. While the reports and proceedings of the congresses are of great value and importance, comparatively little attention has been paid to them in this country, the Pennsylvania R. R., New York Central R. R. and Canadian Pacific Ry. being the only railways in North America which are members of the congress. It is hoped, however, to have a good representation of American railways at the London meeting, as they could furnish much valuable information in regard to several of the subjects to be considered, and would find, too, that there are things to be learned from foreign railways. A general account of the organization was given in our issue of March 26, 1892, and a summary of the conclusions presented at the last meeting was given in our issue of July 27, 1893.

The International Railway Congress, as already stated, is composed of representatives of railways owned by governments and by companies, and it numbers among its supporters at the present time about 275 separate railway undertakings, belonging partly to the governments of different countries and partly to private companies, the length of line represented being upward of 125,000 miles. The governments of more than 50 different countries also support the congress and subscribe annually to its funds. They include the government of almost every country on the continent of Europe, of Great Britain, of most of the leading British colonies, and of British India. These governments will send their representatives to the London meeting. The 275 separate railway undertakings which have joined up to the present time comprise the administrations of almost the whole of the railways of the continent of Europe, whether in the hands of the state or of private companies, every important company in the United Kingdom, the Pennsylvania R. R. of the United States, and numerous other railways in every quarter of the globe. Any railway administration working at least 32 miles of line by ordinary steam locomotives, or 16 miles by electricity or other special form of traction, is eligible for membership. Members pay a subscription of $20 per annum, plus 5 cts. per mile of line open, with a maximum of $120 in the case of railways on this side of the Atlantic. Membership can be resigned at any time, and beyond the payment of the above-mentioned annual subscription, entails no liability. To each meeting of the congress the railway companies which are members send a number of delegates in accordance with the following scale: For a system under 62 miles in length, two delegates; under 311 miles, three delegates; under 622 miles, four delegates; under 933 miles, five delegates; under 1,244 miles, six delegates; under 1,555 miles, seven delegates; over 1,555 miles, eight delegates as a maximum. Delegates must be in the service (though not necessarily the exclusive service) of the company delegating them. Governments, as such, may also become members by subscription, paying what annual subscription they please, and sending as many delegates as they think proper. Each railway administration admitted to membership is entitled to receive as many sets of the publications of the congress as the number of delegates to which it is entitled, plus one. The publications are very voluminous, consisting mainly of a periodical "Bulletin" containing the reports and discussions, which are extremely valuable additions to railway literature.

The whole of the publications connected with the London meeting will be issued both in French and English, and the discussions at the meeting itself will also take place in the same two languages. The constitution of the congress does not permit of individuals joining, and, therefore, with the exception of the small number of persons nominated to represent their respective governments, no one can take part in the proceedings at the meeting unless he has been specially delegated for that purpose by a railway administration which has been formally admitted to membership of the congress.

The permanent management of the affairs of the congress, including the arrangements for papers and reports, the editing of the Bulletin, etc., is in the hands of a commission of 30 members, one-third elected at each session, besides the ex-presidents, who become life members of the commission from the commencement of the sessions over which they preside. It is provided that not more than nine members out of the 30 shall belong to the same nationality. The permanent commission has an executive committee composed of seven members. For the purpose of a session of the congress

the permanent commission has power to organize (as temporary members only) a special section or committee in the country where the meeting is to be held. In 1889 the French section numbered 15 members; in 1892 the Russian section numbered 22 members, and in 1895 the English section will consist of 22 members. This section has already been organized. The English railway companies, who will occupy the position of hosts, have appointed a committee to make the necessary arrangements, and during the session there will be excursions to points of railway interest in the United Kingdom.

The congress is divided into five sections, as follows: (1) Permanent Way and Works; (2) Locomotives and Rolling Stock; (3) Traffic; (4) General; (5) Light Railways. The discussions are confined entirely to the subjects contained in the official list issued a long time in advance and we give below an abstract of the list for 1895. The discussion bases itself upon the "Reports" and "Notes" sent in, printed and circulated in advance. A "Report" is a paper on one of the subjects in the official list, contributed by a writer specially nominated by the permanent commission. The "reporter" can either issue a detailed list of questions in order to obtain the information required for writing the paper (somewhat on the same plan as the question circulars issued by the Master Car Builders' Association committees), or he can write it from his own independent experience and investigation. The paper or report is sent in by the end of September at latest, and is then printed in the Bulletin. At the congress meeting the writer is, if possible, present in the section to which the subject belongs, and gives a summary, not more than three pages in length, presenting his conclusions. This summary may be printed at the end of the paper or reserved with a view to possible modifications as the result of the discussion or of "notes" on the subject sent in by other members. In this case a verbal summary is presented.

While a report is understood to be a summary and digest of the opinions and experience of the railway world at large, a "note" is understood to represent only the individual view or experience of the writer and his company. The reports are printed in any case, but notes must be submitted first to the permanent commission. This, however, is mainly a formality, as such notes are always welcomed and the information embodied in them is often found to be of great value in itself and as a basis for oral discussion.

When the discussion has proceeded to a unanimous expression of opinion, or to a decided majority on one side or other of the question, the secretary of the section endeavors to formulate such expression to be voted upon. If the vote is in favor of the view as thus presented, it is then submitted to the congress at a meeting of the whole, where it is read and generally approved without discussion, after which it is published as the deliberate opinion of the congress.

The President is Mr. Dubois, Administrator of the Belgian State Railways, and Mr. Weissenbruch is Secretary. Sir Andrew Fairbairn, Director of the Great Northern Railway, is President of the English Section, and Mr. W. M. Acworth is Secretary of that section.

In regard to the list of subjects given below, it will be noted that many of the details have been the subject of investigation and experiment in this country. The matter of steam distribution and balanced slide valves, included in subject No. 6, was held over from the last meeting in order to enable information to be gathered as to American practice. The matter of the relation of governments to the promotion of light railways, in subject No. 17, was introduced by request of Sir Courtenay Boyle, Secretary of the Board of Trade, of England, in view of the recent agitation for the construction of light railways to relieve the agricultural depression in England and to develop the resources of the colonies. The construction of secondary or light railways in England is hampered by cumbrous and extravagantly expensive "parliamentary proceedings," by requirements for unnecessarily heavy construction, and by requirements for refinements in signaling and safety appliances fitted for main lines with heavy traffic. Many of the colonies, too, have failed to realize the principles of the rapid construction of light railways for development purposes. England, therefore, may learn much from the light railways of thickly populated European countries, while the colonies (and some other thinly settled countries) may learn much from the experience and practice of the United States.

Some of the subjects are assigned to a single writer, and other questions to two or even three writers. In the latter cases a joint report may be made, or the reports may be separate, care being of course taken by previous understanding to prevent the reports clashing or overlapping. Sometimes there is one writer for England and a second for the continent, it being understood that the former implies not only all English speaking countries, but all railway administrations of which English is the natural language. It will thus be seen that the reports and discussions will be of international and not merely of European importance.

It is to be hoped that before the end of the year the International Railway Congress will have a large accession of American railways and that these railways will be well represented at the meeting of 1895. The following is an abstract of the official list of subjects for the meeting of 1895:

Section 1. Permanent Way and Works.

1.—**Strengthening Track in View of the Increased Speed of Trains.—Type of track, section of rail and quality of steel, including comparison of soft and hard steel. Rail joints, ties and ballast.**

2.—**Special Places in Track.—Means to avoid the necessity of express trains slackening speed, and to prevent shocks in passing sharp curves, long and heavy grades, split switches, track and road crossings at grade, drawbridges, etc.**

3.—**Junctions.—Best arrangement on main lines to avoid having to slacken speed, and the best means of maintaining speed with safety while abandoning superelevation on the junction curves.**

4.—**Construction and Tests of Metal Bridges.—Specifications and requirements for grade of metal. Methods of original and periodical testing of bridges, and can such methods be regarded as of practical value in settling the actual state of repair and margin of safety.**

Section 2. Locomotive and Rolling Stock.

5.—**Boilers, Fireboxes and Tubes.—Steel boilers and fireboxes. Purification of feed water. Experiments as to the production of steam, viz.: results obtained with tubes of different dimensions, material and spacing; influence of smokebox capacity and form of smokestack, spark arrester and exhaust pipe, and the influence of speed on the production of steam.**

6.—**Express Locomotives.—The type of engine and and the use of high pressures and the compound system. Steam distribution and balanced slide valves. Locomotive construction (simple and compound), from the point of view of diminishing the strains on the track.**

7.—**Rolling Stock of Express Trains.—Cars for express trains and long journeys. Vestibuled trains. Improvements in interior arrangements, and in car heating and lighting.**

8.—**Electric Traction.**

Section 3. Traffic.

9.—**Acceleration of Freight Traffic.—Influence of speed upon the expenses of hauling, the utilization of cars, the number of cars and the accommodation and plant required.**

10.—**Station Working.—Methods of accelerating the switching of cars and handling of freight. Sorting yards. The employment of mechanical and electrical appliances in switching and in making up trains.**

11.—**Signals.—Improvements and economy in block and interlocking plants. Signals in tunnels. Form instead of color signals to avoid the dangers from color blindness or defective sight. Methods of preventing collisions at dangerous points on express lines in case of trains passing signals at danger.**

12.—**Cartage and Delivery.—The collection and delivery of freight.**

Section 4. General.

13.—**Organization.—Central administration and executive and outdoor staff.**

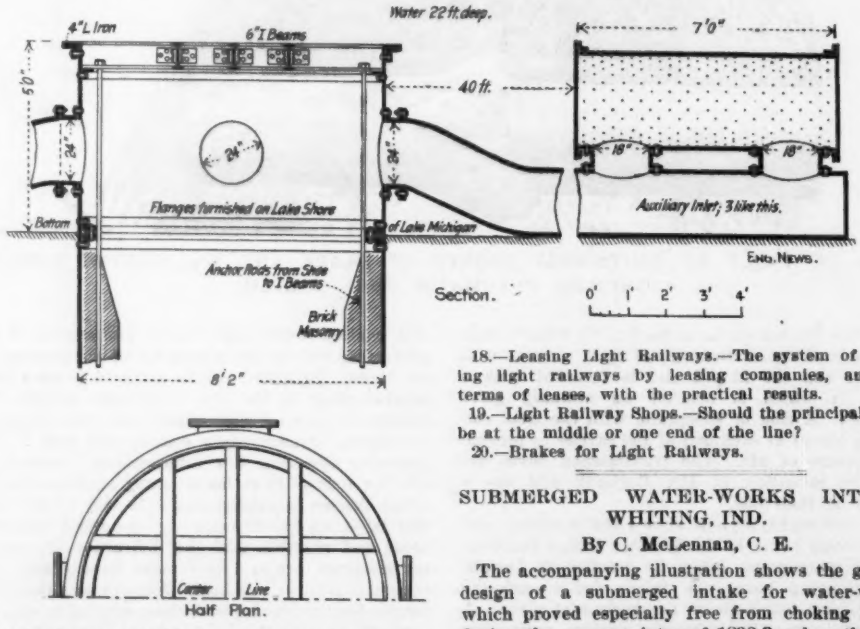
14.—**Settlement of Disputes.—This refers to disputes between railways as to freight traffic.**

15.—**Twenty-Four Hour Notation.—Introduction of timetables reckoning time from 1 to 24 hours. Division of the hour into 100 parts. Alteration of clocks. Present status of the question.**

16.—**Decimal System.—The general adaptation of the decimal system in calculations and accounts, and the general introduction of the metric system.**

Section 5. Light Railways.

17.—**Contributive Traffic.—A method for main railways to encourage the building or working of light feeder lines. In the case of light railways what relaxations can be made by the government in its standard requirements of construction or working without risking the public safety.**



MULTIPLE SUBMERGED WATER-WORKS INTAKE AT WHITING, IND.; C. McLENNAN, ENGINEER.

18.—**Leasing Light Railways.—The system of working light railways by leasing companies, and the terms of leases, with the practical results.**

19.—**Light Railway Shops.—Should the principal shops be at the middle or one end of the line?**

20.—**Brakes for Light Railways.**

SUBMERGED WATER-WORKS INTAKE, WHITING, IND.

By C. McLennan, C. E.

The accompanying illustration shows the general design of a submerged intake for water-works, which proved especially free from choking by ice during the severe winter of 1892-3, when the flow of water through the ordinary crib intakes in Lake Michigan was in some cases entirely suspended and in all other cases maintained only at great expense.

This intake was designed and constructed by the writer in 1890 for the refining works of the Standard Oil Co., at Whiting, Ind., and is located at the terminus of a brick tunnel 5¼ ft. in diameter, which extends from the pump house about one-half mile underneath Lake Michigan, at a depth of about 60 ft. below the surface of the water. Throughout its entire length the tunnel passes through a layer of hard, unstratified blue clay, free from sand pockets and especially well adapted for rapid and economical tunneling. The writer believes that this stratum of clay underlies the entire extreme southern end of Lake Michigan.

To construct the intake a circular steel cylinder 8 ft. in diameter and 15 ft. long, with a heavy cast iron cutting shoe at the bottom, was first provided. The inlet proper, 5 ft. long, was attached to the upper end and to this was bolted a steel cylinder 35 ft. long, which served as a cofferdam during con-

struction and was removed after the completion of the work. This entire cylinder was floated into position between temporary protection piling, raised on end by a derrick and sunk in its exact position to the bottom of the lake. The sand overlies the clay to a depth of 5 ft. at this point. After throwing out the sand from the interior of the cylinder by a centrifugal pump, work was begun sinking the cylinder. The weight necessary to force the cylinder down was obtained by placing a circle of steel rails inside, with the lower ends resting upon the interior projection of the cast iron shoe. This weight caused the cylinder to follow the excavation very satisfactorily. After the excavation had reached a sufficient depth to leave the top of the inlet proper about 5 ft. above the bottom of the lake, the loading was removed and the excavation continued to an intersection with the tunnel, the sides being carefully timbered.

The brick walls of the shaft were then begun and extended up to the bottom of the cast iron shoe and then from the top of the shoe inside the cylinder to the lake bottom. These walls were 12 ins. thick. Anchor rods extend from the bottom of the shoe up through the brick lining to a connection with the open grating of 6-in. I-beams at the top of the intake. Other details of the construction are clearly shown by the drawing.

The main volume of water is taken in through the grating at the top of the intake. The stoppage of water by the choking of this grating with ice, however, is provided against by extending three 2-ft. diameter wrought iron pipes from the intake cylinder along the bottom of the lake about 40 ft. to perforated cylinders, as shown in the drawing.

There was no obstruction of this intake by ice during the severe winter referred to, although from 30 to 40 millions of gallons of water per day were pumped through it. During the same time the crib intakes supplying water to the city of Chicago were seriously obstructed, causing great inconvenience and even danger to the city for want of water. Remington & Co., Chicago, were contractors for this work, with Mr. J. H. Brown as superintendent.

THE PROSPECTS FOR YOUNG ENGINEERS.—A SYMPOSIUM.

Recent Changes in the Engineering Profession.

Engineers may be divided into two classes, viz.: those who rise more or less rapidly and those who do not rise at all, or, at least, rise very slowly. The engineering profession has been changing for a number of years, and in consequence of this the condition of the younger members of the profession has changed also. In old times the chief engineer of a railroad did practically everything. He built the road, built the bridges, made the frogs and switches, looked after the locomotives and cars, and, in fact, was supposed to be able to build and repair almost everything used upon the railroad. Today it is different, for the chief engineer of a railroad simply decides that the company will use certain types of bridges, and buys them as he would buy a sewing machine; they are furnished by parties who make a specialty of building bridges. The switches, frogs, etc., with a complete system of interlocking apparatus, are purchased from firms who make a specialty of building them, as are also the locomotives and cars. In fact, the actual work of the chief engineer of a railroad in full operation is often almost reduced to knowing, first, what are the best articles to use and how to obtain them; and, secondly, how to put them together and use them after you have got them.

In consequence of the consolidation of railroads, by which thousands of miles of road come under one head, one man can, and does, decide such questions for a large portion of the United States just as well as for a road 100 miles long. The result is that there has been a very great diminution in the number of engineers employed per mile of road and a great increase in the number of assistants compared to that of chief engineers, and that there are a large number of engineers in subordinate positions—such as chainmen, rodmen, draftsmen, etc., for whom there may be little or no chance of promotion; and there are many who must occupy practically the same positions all their lives, as there are very few men above them to whose positions they can hope to succeed. The introduction of the blueprint process has done away with a large number of draftsmen, and has changed very materially the methods of doing engineering work.

If a student, after graduating, obtains a subordinate position of the kind which 25 years ago was the most common (rodman, draftsman, etc.), his promotion is likely to be very slow, particularly if it is in an old institution, unless he is able to make a place for himself outside of the regular line of his work. The real truth of the matter is, that in proportion to the work done, the number of men who are engaged in the actual designing, planning and superintending is very small compared with the number of those who are doing more or less mechanical work; that is to say, that the chief engineer, with two or three assistants, will employ, perhaps, 30 or 40 draftsmen, transitmen, and other assistants of this character, while the amount of work turned out, due to the fact that each man is employed on one specialty, is greater than under the old system. It is nothing more or less than the extension to engineering of the methods of the division of labor.

On the other hand, there is a very decided and growing tendency to place the work, which was formerly in charge of men who had risen from the ranks and had become foremen, in the hands of graduates of technical schools, who, after graduating, have learned the practical part of the business in the works themselves; and, being thus fitted both theoretically and practically for the work in hand, are able in most cases to do better. In addition, there is a desire on the part of many of the more intelligent employers to encourage their workmen who are to occupy places of responsibility to fit themselves by studying, drawing and the elements of mechanics, physics, and mathematics, to better understand and carry out the instruction of those who have the designing and supervision of the work.

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The position which the successful engineer occupies to-day does not depend upon whether he graduated as a civil, mining, mechanical or electrical engineer, but upon the fact that he has a mind, and has had a training which has enabled him to develop in the particular direction in which there was the greatest chance of advancement in the business in which he was engaged. In other words, you will find mining engineers coming to the front in railroads, mechanical engineers coming to the front in mining, civil engineers coming to the front in metallurgy, etc. There is no better example of this than the late Alexander L. Holley, one of our founders and past presidents. When he entered upon his career there was no branch of engineering in which it seemed less likely that he would make the great success of his life than in metallurgy of steel, and yet there is no one who contributed more to the development of that industry in the United States than he.

* * * * * *

It seems to me, therefore—and I express my opinion with a great deal of diffidence—that the technical school should strive to produce rather well-trained, all-round men than specialists; that is, to allow nothing to interfere with giving students a thorough training in all those branches which form the groundwork of all engineering, and that the training in each branch should be so arranged that the student should be equally well grounded in all; that is to say, that no one branch should be carried to a higher point than another, or, rather, that no one should be slighted in any way. In other words, that the student should have as much knowledge of each of the branches as is necessary for him to thoroughly utilize his knowledge of the others.

The students, under these circumstances, could enter almost any establishment and very soon make themselves very useful men by further training, instead of being specialists, who, if they should not obtain employment in their specialty, would be practically of no more value than untrained men.—From the Presidential address of Hon. Eckley B. Coxe, before the American Society of Mechanical Engineers.

Is Electrical Engineering an Overcrowded Profession?

An electrical engineer in good standing and of excellent attainments and experience was engaged recently by a manufacturing company to design for it a new street railway motor. He did so, with details as to windings, weights, dimensions, efficiency, and other matters. He was paid $25, and the purchasers were disappointed to learn that the price did not include a full set of tracings and blue prints to work from in the shop. These, however, which would take, perhaps, a couple of weeks to get up, they were offered for another $100.

When we remember how much the designing of street railway motors has done for the fame and fortune of early workers in this field, it would seem, indeed, that the profession has fallen upon evil times when a new motor can be designed by an engineer for the wage that is paid in a single week to an ordinary clerk or mechanic. But it is as well to face the facts, and the incident is worth the attention of the bands of young men now pouring every year out of universities and colleges ready to redesign and remake all the apparatus already in use.

What the art wants, in truth, is not new designs so much as men able to get the best results out of the old; not new designs in an industriously cultivated field, but pioneer work in branches of the art that have not yet been attacked. There are plenty of good street railway motors, but there are very few roads where the employment of a staff of competent engineers would not be attended with large savings. The central lighting stations are full of admirable dynamos, but the dividends earned by careful management and technical ability are scanty and wide apart.

There is a slight consolation in the fact that even in these dull and dreary days, at least one concern is willing to spend the enormous sum of 25 good dollars in obtaining designs of a new motor to build. There is the further consolation that the cheaper motors, dynamos, lamps and switches are, the larger the demand is likely to be, and the greater the consumption of current and supplies.—Editorial in the "Electrical Engineer."

Mechanical Engineering in England.

To the Editor of "The Engineer":

Sir: Will you permit me, as a father of a family and an engineer, to direct the attention of such of your readers as are in a similar position to facts which appear to be quite forgotten? In selecting a profession or an avocation for their sons, parents pitch upon engineering, and the results can scarcely fail to be disastrous. Fathers and boys alike know next to nothing about the business, and their very ignorance leads them astray. A typical instance presented itself not long since. A very dear friend was most anxious to make his son a mechanical engineer. The lad had been brought up in considerable luxury, for his father, though not wealthy, was well off. I did what I could to make the truth clear, but the lad and his father were resolved. I used my influence, and succeeded in getting the lad—nearly 18—articled to a firm of mechanical engineers of high standing in a Midland town. For the first month things went tolerably well, after that chaos. The lad's father was resolved that, having begun, his boy should go on for the three years, at the end of that time the head of the firm pointed out that it was mere waste of time to go further. "The lad was not composed of the stuff engineers are made of," so at 21 the youth has to begin life again. He explained to me that if he had known what mechanical engineering really was he would never have touched it. He pointed out to me, with much force, that it was an exceedingly dirty avocation; that it involved getting up at 6 a. m.; that he had to stand all day, and work very hard with his hands; that in winter the shops were very cold, and in summer very hot; that he had to mix all day long with men who were not gentlemen, and used very coarse language; that when he was sent out with others to erect machinery, he had to travel third-class in working-day clothes, and that it was impossible to get a decent meal. When he got into the drawing-office matters were very little better, as he was kept for hours over a drawing board, and he was "dreadfully ragged" for errors which, as he said, "were really such trifles. Making a thing 2 ft. long which ought to have been 2 ft. ½ in., for instance," and so on. I dwell on this case because it is typical. Multitudes of young fellows try to be engineers without the most remote notion of the hardness of the life. My young friend, however, got the idea that, although mechanical engineering was bad, civil engineering might be good. One day's experience on an iron bridge being erected over a rapid stream disillusionized him, and so, as I have said, he dropped engineering. His case enforces my proposition, that one of the reasons why young men become engineers is that they are totally ignorant of the life they have to lead.

Certain minor considerations I pass over, and I next come to what is to my mind a very principal cause. It is the multiplication of technical schools in connection with our universities. Now I have not a word to say against technical education for working men; I speak of something much higher. Take, for example, the engineering schools in connection with University College, King's College, and so on. Every day new workshops with most costly laboratories are being opened with a great flourish of trumpets and beating of drums. Lord Kelvin opened one at Cambridge on Monday week, for example. Sir Frederick Bramwell hinted in the course of the proceedings that there might be too many of these things already. I wish he would speak out. All these places compete with each other. They supply employment for professors and demonstrators. The competition for the chairs is enormous; work must be found for these gentlemen, and no stone is left unturned to get pupils. This has gone on now for some years, and is going on still. Now, I hold it is time the truth was made known. The truth is that hundreds of young men are turned out who are believed by their parents, and also by themselves, to be engineers. My standard of an engineer is that the man calling himself one should be able to do work for which he can get paid. Putting this in a very coarse way, I hold that a man is not an engineer unless he knows enough to make his bread by engineering. That is precisely what 90% of the college-trained youths cannot do. No college can give that training which alone imparts commercial value to a man. But let me suppose that the contrary is the case, and that every youth who has had three years' training in a technical college—not school, observe—is really competent in the fullest sense of the term; what follows? I am sure I am not over the mark when I

assert that about 2,000 young men are turned out of the colleges of the United Kingdom every year who are "engineers." Where on earth is this host to find work?

The bitter truth must for once be told. Young men are induced to enter technical colleges and get a training which is absolutely wasted. The whole scheme, from beginning to end, is one of the popular delusions of the nineteenth century. I do not pretend to say that the professors are not very worthy men. In several instances they are engineers who have been failures in practice. A salary of £600 to £1,000 a year is not to be picked up for the asking. I do not blame those who seek it; I do blame the heads of colleges—men who in this insane race for big laboratories, and large lists of students, forget that to a very considerable degree they are really getting money from the public by false pretences, and doing what is worse, wasting the best years of the life of young men. In the face of the most notorious fact that the profession is so overstocked that not 10% of the really trained engineers can get a decent living, the colleges go on doing what in them lies to encourage the turning out of more youths, who, if they were really competent, would starve all the same.

The other day I advertised for a draftsman. I wanted a good man, and I did not hesitate to say that I would give a good salary. I had 400 replies to that advertisement. A firm wanted an engineer to go abroad; he must be able to speak French and Spanish, sign articles for three years, and proceed to an unhealthy part of South America. The standard of qualifications was high; the salary offered was only £300 per annum, and there were 70 applications for it.

I think strongly, and I fear I have written too strongly, but I feel sure that good may be done by making the facts known. I know, Sir, that you have used your powerful influence in the same direction. If I can succeed in saving one young man from wasting precious time in a technical college trying to become an engineer, I shall be happy. If I could induce other engineers to state their views in your pages yet more good might be done.

For myself I have no personal interest in the matter. I have several sons; only one has followed in his father's footsteps, and his future gives me no uneasiness; indeed, he is not the product of a technical college. What I have written is on purely public grounds. One of the principal reasons why so many young men become "engineers" is the touting of technical colleges. If those colleges did not exist the number of "engineers" would be very small. Pater.

Manchester, May 19.

Sir: Your correspondent "Pater" deserves the gratitude of all the young members of the profession for his praiseworthy attempt to dissuade young men from entering a profession which is already crowded to overflowing. While cordially indorsing all that he says as a practical engineer, I wish to point out that, by his own statements, he has gone beyond the sphere of his experience in attacking technical colleges as the source of the evil above referred to. It is a common occurrence in our day to see men build up fantastic theories for the purpose of demolishing them, and I venture to suggest that your worthy correspondent lays himself open to this charge. He clearly has no knowledge of technical colleges, or he would not make the ludicrous mistake of assuming that professors of engineering go touting for pupils, and lead inexperienced parents to believe that when their sons have studied under them for three years they become qualified engineers. I am personally acquainted with most of the said professors in Great Britain, but I must confess that I know of none to whom your correspondent's argument applies. My experience of them is that they are honorable men in the highest sense of the word, and this is fully borne out by the kindly relations which generally exist between professors of engineering and their pupils in after life. Now, Sir, can any one with an atom of common-sense believe that this would be the case if your correspondent's theory was a true one? - A Young Engineer.

Glasgow, May 28.

Sir: While I am strongly disposed to agree with your correspondent "Pater," I would suggest that we have not quite sufficient data to go upon. Is it not possible to obtain some information from the various engineering colleges as to what becomes of the pupils?

I happen to know one professor very well, and he told me with some exultation that in one year not fewer than six of his pupils got berths, four of them as junior foremen, and two as draftsmen. As the average number of his pupils is over 90, I suppose he had reason to rejoice. Guardian.

Notting Hill, May 29.

Sir: As you have invited discussion on the subject of "Engineering as a Profession," I see no reason why I should not call a spade a spade, and tell a few plain truths for the benefit of others like "Pater," whether they are acceptable or not to professors or to mechanical engineers as a body. As to civil engineering, which I have heard profanely defined as "glorified road-scraping," I have nothing to say, because I know next to nothing about it. "Ne sutor ultra crepidam"—let the cobbler stick to his last. I proceed to consider the position of the ingenuous youth who has been trained in a college, and has "gone through the shops," forsooth, as a gentleman apprentice.

This young man, if he has a head upon his shoulders, has made good use of his time. He has learned a great deal, and I shall assume that he finds himself placed in the position of manager of a department. The first thing he discovers is that the firm employing him make, let me say, marine engines, by the dozen, and that they are all alike in every respect save size. There is a distinct set of patterns for each size of engine, and from one end of the year to the other engines are built from these patterns. Now and then small changes are made, never when it is possible to avoid them. None of my young engineer's college training is of the smallest use to him. The sole object of his existence is to get the largest quantity of work turned out on the old lines at the least cost. This is a science in itself, but it is never taught in colleges, or schools, or books.

If any young man gets into a locomotive shop on a railway, he will find, as before, that there is no scope for theoretical knowledge. He may work for 20 years, and build a dozen types of locomotive, and never make a single calculation. Neither he nor any one else wants to know how thick the shell plates should be, or how close the stays, or how thick, or how many threads to the inch. All that was settled years and years ago; a little taking out of the quantities is all the figuring that is needed. Even in the matter of testing, the whole affair is cut-and-dried for him. The one essential is—that he should be able to turn out the greatest quantity of work.

Now I assert, without fear of contradiction, that there is no scope for the display of scientific attainments in mechanical engineering in the present day. It is simply a matter of pounds, shillings and pence. Machinery is no more scientific than blankets or tea. I hear it urged that surely such mechanism as that of the "Havock," let us say, is certainly the result of science. I answer that it is not. It is the result of trial and error; the result of long and costly experiment. It is simply a survival of the fittest. I do not hesitate to say that there is not a portion of the machinery of a torpedo boat whose dimensions have been arrived at by calculation. Does any one suppose that steel framing has been calculated at so many tons per sq. in. of section. Not a bit of it. Does any one imagine that they will find in a book a rule based on calculation that will give them the dimensions of a torpedo boat crank shaft, or of a leading axle of a modern express locomotive? If they do they have everything to learn. All the so-called special mechanism that we see around us has grown. If there are any rules extant that can be taught, they have been deduced from the machines, not the machines from the rules. As for the other machinery of the world, it is all cut and dried. Nothing is taught in college or school that is of the least pecuniary value in this direction.

"Oh," but it will be said, "look at the new machines, look at the oil engine, for instance." When I hear this I always laugh, I cannot help it. The oil engine has emanated from men who have had no scientific training. One of the best is the invention of a medical man. There is not a college professor in existence who ever invented one, or even hinted that one was possible. I do not think that any knowledge of thermodynamics has ever come to the aid of any one making them. The scientific side of mechanical engineering has no existence of the brains of professors.

I have said I would call a spade a spade. I do so. Mechanical engineering in the present day is not a profession, it is a trade. It has only one aspect, the commercial. It has been found that there is no money, but very much the reverse, in scientific mechanical engineering. What the young engineer wants is a knowledge of men; great forethought; an infinite grasp of the future, its eventualities and possibilities, discipline; organization; zeal; perfectly in tune with every surrounding note, order. Let me explain. If work is to be turned out in quantity no department of the works must be idle; none run overtime to supply the demands of the remainder. The turnery must not be idle, waiting on the foundry for castings. The erecters and fitters must not be kept standing because they cannot get the work from the turners or planers. Just think what this means in a large establishment. Is it possible to overrate its importance? I tell you, Sir, and I tell your readers, that it is in this matter of keeping all going together that success lies. Firms have been ruined in a couple of years after long periods of prosperity, simply because of a change of management. I have known men to be dismissed because, forsooth, they were not engineers, and I have known the same men to be sought out and implored to return. Of course I cannot give names.

All this is quite outside a college training. It is not at all outside the training to be had in works. If a young fellow keeps his eyes open, he will soon find out why he and his mates are working overtime, on the one hand, or, on the other, are trying to ferret out jobs to keep them from being idle. Of course, if a young man does not keep his eyes open he will not see these things.

Now, Sir, in all this I have not referred to the question whether mechanical engineering is a good profession or not. I hold that it is not a profession at all—that it is a trade or business. But I will go on to add that it is simply first-rate for those who have really learned it. A good manager who can get out work up to the mark is worth his weight in gold. There is a never-ceasing demand for good men, but scientific mechanical engineers are simply a drug in the market. The Admiralty have been for years training engineers, and making men of science of them. They are now beginning to find out that all this is worse than useless, and that what suffices to pass the Board of Trade is good enough. Denarius.

Manchester, June 5.

Sir: "Pater's" letter deserves the attention of other paters and their sons, who propose to take up engineering as a profession. Parents who have had non-commercial careers, such as military, naval, clerical, and medical men, are too apt to gage the advantages of the profession through contact with those who have been successful. Technical education is of value to every engineer, but that it is not absolutely essential is shown by the numbers of great engineers who have succeeded without it. This fact is overlooked more and more every day, and theoretical training seems to be introduced to avoid so-called shop drudgery, while it is the experience of this shop drudgery which is the key of engineering. Of the large number of young men who enter the lists for engineering fame, only about one-fourth find workshop pursuits tasteful, and a large number of these fail through want of physical robustness; consequently their training must be either in the drawing-office or a college.

Such young men flood the market, and often obtain employment in preference to better men because they can make a drawing a little faster and neater, and will take a smaller wage than the man with shop experience, and also because so many engineering concerns are run by purely commercial men, whose only qualifications generally are cash or interest, and who imagine engineering to be a series of calculations. No account is apparently given to the cost of drawings made twice over, or the extra cost of unnecessary machining due to faulty designs, or the unfitness of machinery to do the work. While this lasts, young men cannot be blamed for following the less arduous college course, which only fits them for the drawing board, generally at a salary less than a laborer, which from a monetary point does not justify the experience in costly college courses. They may eventually drift into positions of trust, at salaries which are a disgrace to those who pay them. I instance a firm who offered for the management of a works employing 200 to 300 hands, a salary of £200 to £250 per annum—about what a good plater can make at his trade. Through bad work and faulty designs, this firm has had to make good machinery which must have cost many hundred pounds. Some day when too late they will realize their mistake. I do not imply that this is universal, but it is as well to know that, taking it all round, engineering is about the worst paid and hardest-worked profession there is. After years of struggle at a salary which barely pays for living, most engineers find themselves nearing the coveted position of trust, which often they do not get; many have, therefore, to end their days in bitter disappointment at a salary of £100 to £150 per annum, while the few who get the plums find them cut down for their benefit to £300 or £400 per annum—about the pension of an officer who would have probably retired at the age when the engineer has worked for and won his prize.

I do not wish to criticise employers on the salaries they pay. Times are bad, their profits are uncertain. One cannot blame them in struggling to cut their expenses down, but I think it is only right parents and lads should know that in following one of the finest, most interesting, and absorbing professions, that for a livelihood it is bad, that the door to good appointments is closed as a rule, without either large interest or capital. Chance may favor, and has favored many men, but should not be relied on. Parents should, therefore, think twice before drifting their sons into an overstocked and under-paid profession, and would do better to take the advice of those who may employ them, or from those who, like myself, are trying to make a living at it. Mechanic.

May 30.

Sir: "Denarius" shows most convincingly that technical education is wasted upon those who deal in scrap iron and the like, but the question is by no means exhausted in his exposition.

Let us first ask ourselves whether there is need of technical instruction. I find the answer to that question very plainly suggested by the following considerations: How am I to know the properties of materials

used in engineering work? How shall I determine the stresses in structures to enable me to arrange my material most economically? How can I design a valve gear correctly without expensive models? Why, in the choice of gearing, is its mechanical efficiency so little regarded? Why are so many air compressors inefficient? How are the stresses in structures affected by the elasticity of the materials used? These are queries which must at some time present themselves to the young engineer, though it is obvious from the work turned out by many firms that their eyes are blinded to these important considerations by the glare of their own self-satisfaction.

"Denarius" says there is no more science in machinery than in "blankets or tea." This is no doubt true in his case. But let me ask who is best fitted to make the long and costly experiments he speaks of—is it the man who is trained to make accurate observations and to conduct experiments successfully, or one whose only knowledge of the subject is the price per ton of material? Your correspondent also says: "The oil engine has emanated from men who have had no scientific training. One of the best is the invention of a medical man." I was not aware that the medical profession is so devoid of the first principles of science—whether applied to engineering or not. This quotation speaks volumes for the cause of technical education, it being capable of the most obvious paraphrasing, namely, that engineers have not the necessary scientific knowledge to assist in the development of their own profession.

F. G.

Leeds, June 9.

Sir: Is not your correspondent "Pater," in your last week's issue, trying to make technical colleges responsible for an evil for which nothing less than the whole social system can be held responsible?

At the present time there are a certain number of "jobs" existing in the world. There are a certain number of men and women candidates for these jobs. The number of men and women largely exceeds the number of jobs.

I can only agree with "Pater" that many men try to be engineers who are not made of the right stuff. But to my certain knowledge technical colleges do a good deal of sifting in this line, and in a way much less expensive of time and money than a pupilage in the shops. To be sure, many men get beyond college and are then stranded, but this in the main is due to overpopulation. No improvements in details of training can alter it.

"Pater" surely does not mean us to understand that in his mind there is an idea of apprenticeship versus technical college as a training for an engineer. The engineer, at any rate of the future, must have knowledge which can only be gained in the shops, and also knowledge which can most easily be gained at a technical college.

What is wanted is that engineers should work hand in hand with technical colleges, instead of affecting to despise them. We might then get much better arrangements, both for sifting men and training them, than we have at present.

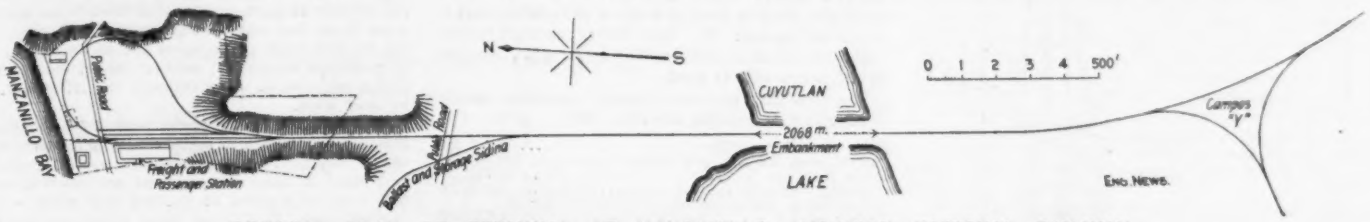
Son.

Bristol, June 6.

Engineering as a Profession.

The case cited by our correspondent "Pater" is by no means exceptional. Many and many are the fathers who find their sons, after having followed a science course, left on their hands non-bread-winners, and forced to seek some new occupation to gain a livelihood; but to say that this is the fault of the colleges, the college authorities, or, primarily, the founders, is perhaps too harsh and broad a statement.

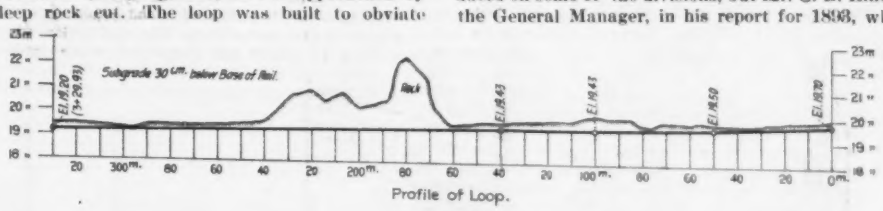
But, furthermore, why should engineering as a profession be more risky than another? Are there not as many medical students entering our great schools annually as engineers our technical colleges? Is the law so much better? How many hundreds are there annually starting on the race for the silk gown? What becomes of all the young men of good parts and high education that our universities annually send out to look for bread? Poor Alma Mater, your loving care and your pride in them has not especially well fitted your sons for the world. Two thousand "engineers," perhaps, are turned out by the technical colleges annually, our correspondent thinks. That would indeed be terrible, were there no vacancies to fill. But there is one thing more terrible, and that is that not 10% of that 2,000 are fit to fill the gaps in the ranks. That is really the question to be faced with regard to engineering as a profession. Not the paucity of vacancies or the crowd of applicants; not the smallness of the wage or the aspirations of the earner; but the inability of the competitor. And are the colleges to be blamed if they fail to give a man the necessary qualifications to become a success in the engineering profession? That technical colleges have faults—and serious faults—we admit, and indeed have been loud in crying out against them. But it must be understood that no education, were it ever so good, can insure a man's success if he lacks one thing—the knowledge of his fellow-man. It would not be difficult to enumerate two score of successful engineers who have started without advanced mechanical instincts, and very little science. It would be difficult to count as many highly-qualified men, other than professors, holding similar lucrative positions. After all, only a very small percentage of men owe a good income to advanced education.—Editorial in "The Engineer."



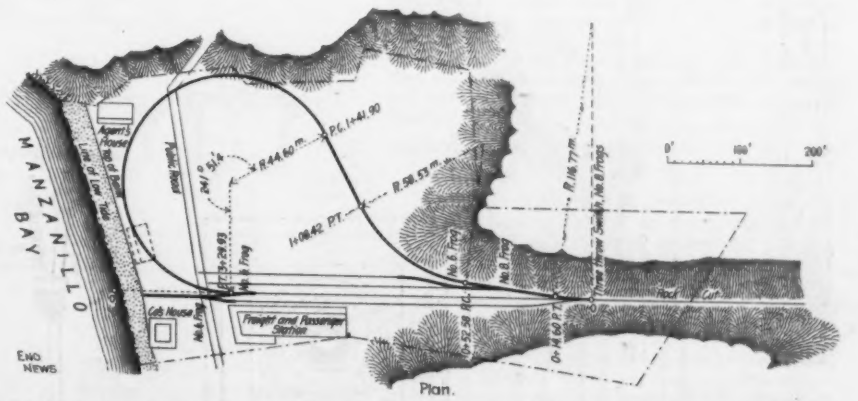
GENERAL PLAN OF TERMINAL AT MANZANILLO, MEXICAN NATIONAL RAILWAY.

A LOOP TERMINAL ON THE MEXICAN NATIONAL RY.

The somewhat novel arrangement of a railway terminal to run trains by means of a loop, as shown in the accompanying cut, has recently been completed at the Manzanillo terminal of the Colima Division of the Mexican National Ry., and we are indebted to Mr. Arthur P. Herbert, Engineer and Superintendent, for a blueprint and description of the arrangement. It will be seen that the yard is surrounded by high ground, and is approached by a deep rock cut. The loop was built to obviate turning the train on a Y 1.86 miles from the terminus, and backing in over an embankment built through a lake, as has been the custom for the past ten years.



Profile of Loop.



Plan.

PLAN OF LOOP TERMINAL AT MANZANILLO; MEXICAN NATIONAL RAILWAY

The radii of the curves used in this terminal loop were determined by the space available for the purpose, and while not nearly so short as some of those mentioned in our issue of Feb 8 and March 1, are much shorter than have been generally used in Mexico, and even on a narrow gage may be classified as extremely sharp curves.

The track is of 3 ft. gage, and on the curve of 44.60 meters (146.28 ft.) radius is laid a guard rail and one blind driver rail, on the inside of the outside running rail. The rails are of 40-lb. steel, laid on hardwood ties (mahogany, etc.) 24 ins. c. to c., all of which had to be bored for the spikes; and as the rails are braced on every fifth tie, this made an average of over nine holes to the tie. The engines generally used are of the mogul type, with driving wheel base of 12 ft. and total wheel base of 18 ft. 6 ins., and the trains vary from four 30-ft. box cars of 10 tons capacity and three 42-ft. coaches, to 20 box cars and five coaches. There is a descending grade of about 1-10 of 1% on this loop in the direction in which the train passes, and the engines do not have any trouble in pulling their trains.

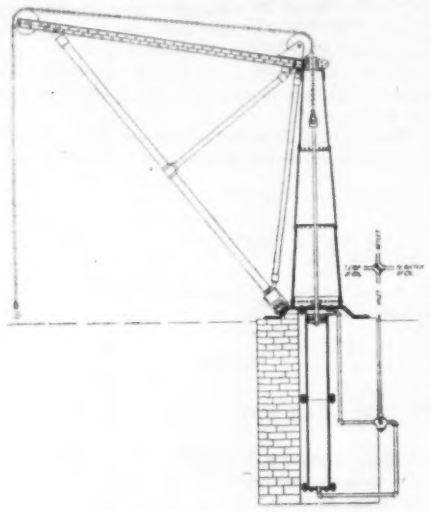
The Colima Division is a short piece of railway extending from the Pacific port of Manzanillo to Colima, whence it is proposed to extend it eventually to a connection with the main system of the Mexican National Ry. at Patzcuaro, which will involve very heavy and expensive work in difficult country.

On the Mexican Ry. curves of 150 ft. radius were successfully used until the tunnels were completed for the permanent alinement. This road, however, is of standard gage.

THE RAILWAYS OF CAPE COLONY.

The Cape Government Railways are now more than paying the working expenses and interest on capital, and the surplus is being expended in improvements and extensions. Grades are being reduced on some of the divisions, but Mr. C. B. Elliott, the General Manager, in his report for 1893, while approving of changing certain grades from 2.5 to 1.25% and flattening some 17° curves, advises the authorities to go slow before committing the government to any large expenditure in this matter. He does not recommend such expenditure unless it is found that the cost of pushing engines or other locomotive expenses would equal or exceed the interest on the extra capital proposed to be sunk in the change of grades. In regard to the train equipment, it is pointed out that something better than oil for car lighting is most desirable, while only a portion of the cars can be lighted by electricity, owing to the expense, although the government has

authorized the electric lighting of through trains. The intense cold during the winter in the inland districts has indicated the necessity of heating the cars and the antiquated and ineffectual footwarmers of "the most recent and improved type" are to be introduced. Compartment cars are used, with three classes, and there are saloon cars for first and second class passengers on the through trains, but no bedding is supplied, though arrangements are be-



5-Ton Hydraulic Crane; Delaware & Hudson Canal Co.

ing made to supply it for a small charge. Some particulars of the saloon cars on these railways were given in our issue of April 27, 1893. The freight cars are mainly open cars, with tarpaulins to cover the freight, and the question of economy in the use of these coverings is discussed in the report, the average life of a tarpaulin being 2½ years.

In the report of Mr. Brown, the Chief Engineer, it is stated that no new lines have been opened since the last report, the total mileage remaining at 2,253 miles, which seems to indicate that here, as in some other colonies, the authorities have not recognized the advantages of light development railways to open up the country, based on the principle of building the greatest length of line as rapidly as possible and with the least possible expenditure of capital. The railway system is divided into four main divisions, of which three start from the three principal ports of Cape Town, Port Elizabeth and East London. The railways are all of 3 ft. 6 ins. gage, which was first adopted under the mistaken ideas respecting economy resulting from narrow gages, and are laid largely with 45-lb. T rails, which are being relaid with 60-lb. and 70-lb. rails. During the year there were 127,884 ties renewed, of which 45,514 were metal ties, replacing cast iron bowl ties. Wooden ties 7 ft. × 10 ins. × 5 ins cost $1.26 each, bored for spikes at the railway shops, and creosoted yellow wood ties cost $1 at the port.

In the report of Mr. Stephens, the Locomotive Superintendent, it is stated that owing to the further introduction of more powerful engines, the train mileage in 1893 was almost identical with that in 1892, notwithstanding the increase of $1,550,000 in the earnings. The coal consumption is about 25 to 30 lbs. per train-mile, both English and native coal being used, though the latter requires a special form of grate. The American rocking finger grate is used in some of the engines and is favorably spoken of. Mr. Elliott strongly advocates the use of as few engines as possible, keeping them continuously at work.

The following are some general operating statistics for the year ending Dec. 31, 1893:

Miles open for traffic	2,253
Capital cost ($44,015 per mile)	$99,163,095
Gross earnings	12,797,710
Working expenses	7,554,730
Net earnings (after certain deductions for other roads)	4,737,105
Operating expenses to gross earnings	59%
Train miles	6,974,922
Total earnings per train-mile	$1.76
Total operating expenses per train-mile	1.04
Total earnings per mile of railway	5,680
Total operating expenses per mile of railway	3,375
No. of locomotives	352
No. of cars for passenger service	435
No. of cars for freight service, etc.	5,463
Population (white) includ. Orange Free State	485,000
Miles of railway per 1,000 of white population	4.65
White population per mile of railway	215

COMPRESSED AIR AND HYDRAULIC MACHINERY IN CAR SHOPS AND YARDS.*

From reports received it appears that air appliances are in limited use in car shops and yards, only a very small percentage of railways being fairly equipped. Those who have had experience with such machinery are unanimous in its favor, and report it as being economical, giving satisfaction wherever used, and they express their intention of making additions to their plants in the near future. The application of air appliances to use in car shops and repair yards being comparatively new, your committee desires to call attention to the various improved appliances, especially those of recent design, as shown in cuts forming part of this report, as it fully believes that there is a large field in the car department for which this class of tools can be improved and adopted with economic results.

Replies to the circular issued show that compressed air appliances are in use for the following purposes in car shops and yards: Operating pneumatic jacks for lifting and lowering freight cars; operating drop pit jacks, for removing and replacing car wheels in trucks under all classes of passenger equipment; operating small pneumatic portable jacks, for lifting M. C.-B. couplers into position; operating pneumatic pull-down jacks for pulling down effective sills, needle beams and body bolsters from cars undergoing repairs; applying couplings and fittings on air-brake hose; cleaning cushions, upholstery, carpets, etc., in passenger and sleeping cars; loading wheels and exles; raising and lowering furnace doors; operating pneumatic lifts over planers, lathes, hydraulic presses and boring mills; raising the coal and iron up to level of cupolas in foundries; lifting weights for breaking old car wheels; operating pneumatic drills; riveting car truck channels; blowing blacksmith forges (adjacent to repair tracks); transferring oil from barrels into tanks, or from one set of tanks to another; punching sheet metal and other work in tin and copper shops; testing air-brakes; blowing out and cleaning hot water and steam heating pipes in passenger equipment; sanding freight car roofs; applying satin finish on silverware, car trimmings, etc., by sand blast.

At present the most common method for obtaining air pressure with which to operate air appliances is by the use of locomotive air-brake pumps; some members report three of these pumping into one reservoir to furnish required amount of air, but this practice is not recommended. In a small plant where one pump can supply all the air necessary, the small cost of purchasing, installing and maintaining the compressor makes its use permissible. But on account of the particular kind of service for which locomotive air pumps are designed, the necessity for simplicity will not permit of the use of cooling devices for the air cylinder or the additional mechanism necessary to use steam expansively; and for these reasons, if air is wanted in considerable quantities some form of compressor embodying the above-mentioned advantages and regulated automatically, should be employed. One member reports an air pump attached tandem to the stationary shop engine; this plan is not recommended, as the load is constant on the engine whether air is being used or not, and if the supply is greater than the demand, the surplus air pressure is relieved by a safety valve at the sacrifice of economy.

Your committee would here recommend a few points to be observed when establishing air plants:

1. Arrange for the admission of cool air into the compressor, as the cooler the air can be taken in, the greater the economy in the cost of compressing.

2. Clean air, free from disagreeable odors, is desirable for cleaning purposes, and should be provided for at air compressing plant.

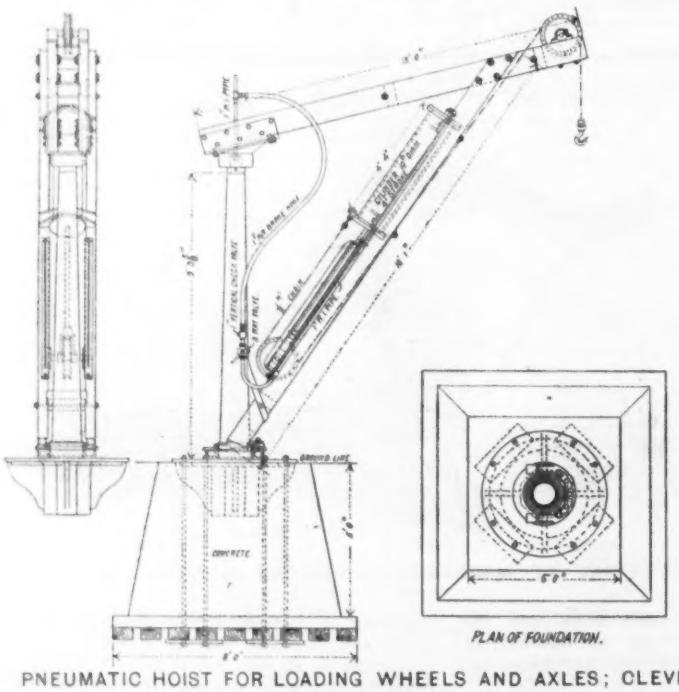
3. It is advisable that the storage reservoir be placed at no great distance from the compressor, the principal reason being to lessen the liability of yard pipes freezing in cold weather. Proper provision should be made for drainage of pipes.

4. All pipes for conveying the air should be of sufficient size to prevent loss through friction, bearing in mind that they cannot be too large, as the volume of air contained therein represents that much increase in storage capacity.

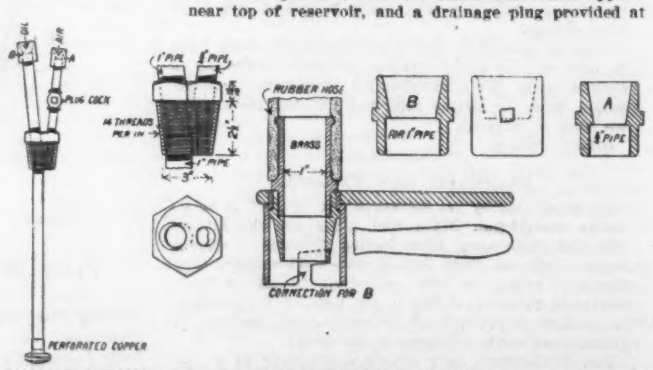
5. To prevent moisture, dirt and oil from passing into the air-using appliances, the inlet and outlet of compressed air in the storage reservoir should be separated as far as possible, and the outlet connection applied near top of reservoir, and a drainage plug provided at bottom for purpose of draining off accumulations of water, oil, etc.

Explaining the value of compressed air appliances, mentioned herein, it is reported to your committee that the pneumatic jacks or drop pits corresponding to those of the Lake Shore & Michigan Southern, and Chicago, Rock Island & Pacific railways, effect a saving of 47½% in the work of changing wheels in passenger car trucks.

* From a report of a committee of the Master Car Builders' Association.



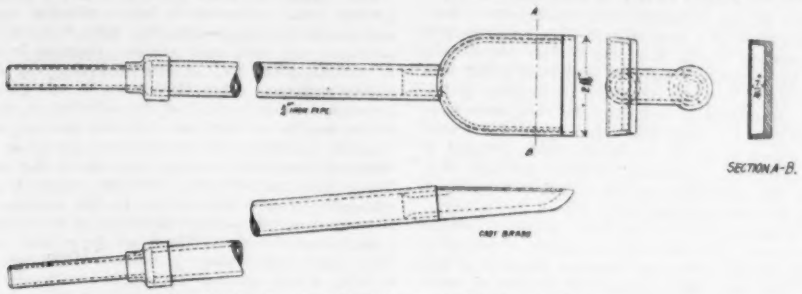
PNEUMATIC HOIST FOR LOADING WHEELS AND AXLES; CLEVELAND, CINCINNATI & ST. LOUIS RAILWAY.



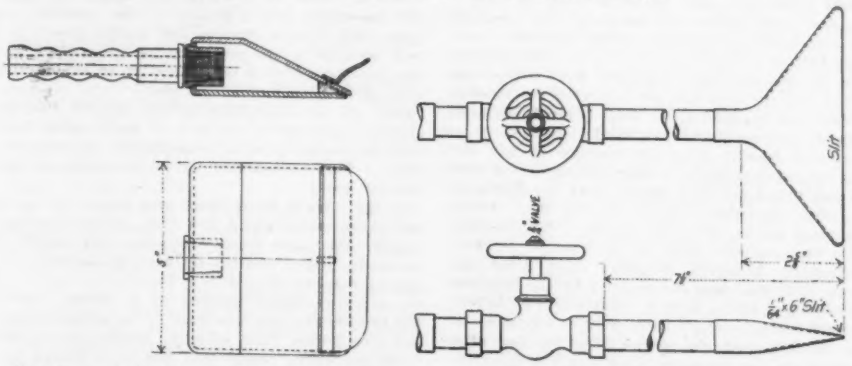
PNEUMATIC PUMP FOR TRANSFERRING OIL FROM OIL BARRELS TO TANKS IN OIL HOUSE; NEW YORK, LAKE ERIE & WESTERN R. R.

The devices for cleaning car cushions by air, shown by actual tests made by the committee, result in a very large saving. The average time consumed by two men (one operating a 5½-in. cleaning nozzle, the other handling seats) in removing the dust from plush and springs of 200 seats, making them absolutely clean, was from 27 to 33 seconds to each seat. The air used in this test was supplied from a reservoir, and varied from 90 to 60 lbs. pressure. A similar test at cleaning by hand with common rattan beaters and brushing process by two men consumed from three to four minutes to each seat, effecting a saving of time in favor of cleaning by compressed air of 85%.

The committee witnessed a test with pneumatic pulling-down jack in pulling down a defective oak center sill from freight cars where the vertical bolts securing the same had become corroded, and would not yield to the blows of a heavy sledge hammer. The pneumatic pulling-down jack was placed in position in two minutes, and sill pulled entirely loose at one end in 40 seconds; the machine was again reset in two minutes, and the other end of sill removed in 30 seconds, making 5 mins. 10 secs. to remove center sill by two men, which we estimate would have taken the same men from 30 minutes to one hour to have removed. Several members report using pneumatic jacks for lifting and lowering purposes in car shops and repair yards, operated by a line of pipe leading from air reservoir, and located convenient to tracks, from which a hose connection to jack furnishes the air pressure required, and all report great economy resulting from their use over the present common screw and hydraulic hand jacks, a saving in some cases of 51½%.

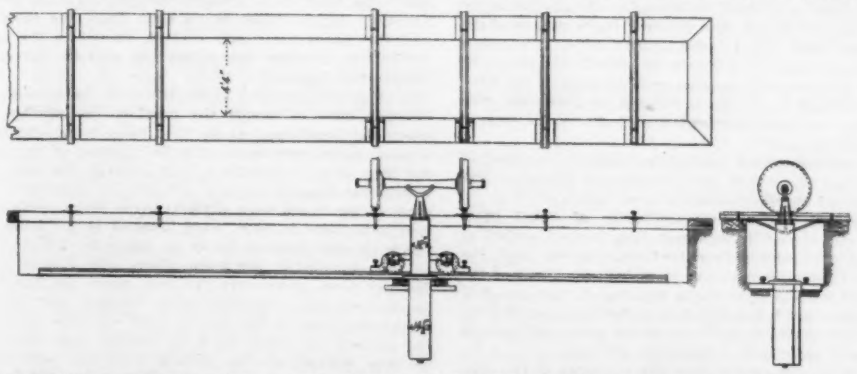


Cleveland, Cincinnati, Chicago & St. Louis Railway.

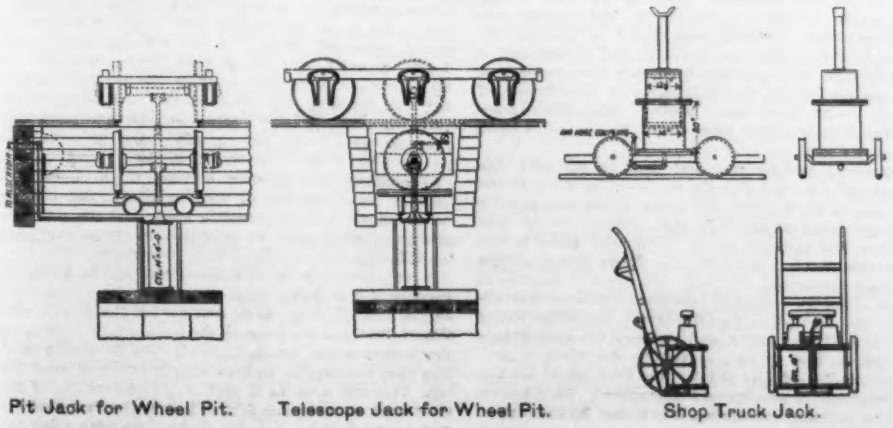


New York, Lake Erie & Western Railway. Chicago, Rock Island & Pacific Railway.

PNEUMATIC DUSTER NOZZLES.



PASSENGER TRUCK DROP PIT JACK; CHICAGO, ROCK ISLAND & PACIFIC RY.



Pit Jack for Wheel Pit. Telescope Jack for Wheel Pit. Shop Truck Jack.

PNEUMATIC TOOLS OF LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

Special attention is invited to the air appliances for applying fittings to air-brake and steam hose, especially machines similar to the one in use on the New York, Lake Erie & Western Ry., which is reported to your committee as performing the work it would take eight men to do by hand. Several other well-designed machines of this nature were described and reported as productive of great economy. Investigating these machines further, your committee finds:

1. You can use up all the rusty couplings, and you can apply an old coupling as easily as a new one. By hand it would be almost impossible to get an old coupling into some of the air hose.

2. It admits of having air hose made so that it will take from 20 to 30 lbs. pressure to apply couplings, and by so doing you do not require to depend so much on the band or clamp for securing hose on coupling, thereby reducing the liability of hose blowing off of coupling when in service, causing delay, etc.

3. With one or two of these machines located at convenient points on a system, all of the hose can be fitted up where machines are located, which would concentrate the stock, consequently doing away with the necessity of other repair points carrying this material, effecting a large saving on account of not accumulating a surplus stock.

The novel and satisfactory feature of whitewashing a roundhouse, as reported by the Chicago, Burlington & Quincy Ry., and one or two other roads, by placing liquid lime in a small reservoir and charging the same with compressed air and applying the whitewash by means of hose and spray nozzle, we believe could be successfully employed with saving results for rough structures about a car shop plant or yards, and the subject is worthy the consideration of the members.

It was reported by the manufacturers of air appliances that superheated compressed air used in air lifts, jacks, engines, etc., increases the efficiency fully 50%, but your committee was unable to make test or procure reliable data on the statement which would be of value in deciding the question as to cost, feasibility and economy in use.

The committee is indebted to the Delaware & Hudson Canal Co. for a number of blueprints showing the application of hydraulic machinery as used in its car shops, and reported as resulting in a very noticeable saving of labor. The investment to construct and operate this machinery and the cost to maintain it are moderate. We were not successful in procuring the exact saving in labor by their operation, but believe that they are highly worthy the investigation of every member desiring this class of machinery, some of which is already in use on a number of railways in the following service: In car shops, operating cranes, swinging and traveling; operating elevators and lifting jacks, car wheel and other presses, testing hot-water and steam-heating pipes, straightening forgings, moving transfer tables, testing capacity of car springs, etc.

A large number of compressed air appliances are located out of doors under circumstances where the water used in hydraulic machinery would not be economical to maintain on account of freezing, and therefore your committee decides that hydraulic machinery does not possess as many advantages for car repairs and construction purposes as compressed air appliances.

REMOVAL OF ROCK IN 35 FT. OF WATER, NORTH RIVER.*

By John A. Bensel.

The work consisted in the removal of about 2,000 cu. yds. of rock in the vicinity of Pier No. 14 (new), North River, by the Department of Docks, New York city, and was necessitated by an alteration in the use to which the pier was to be put, it having been originally intended for railway purposes, but being afterwards leased to the American Line of steamers.

As the mean rise and fall of the tide at the location in question is about 5 ft., the operation of making a grade of 35 ft. below mean low water necessitated the use of appliances that would operate and do this work in 40 ft. of water, and also accommodate themselves to the rise and fall of the tide while in operation. Operations were commenced under contract on July 25, 1892, and were completed by the Department of Docks on Sept. 30, 1893. During this entire period the plant used by the Department was found efficient during all kinds of weather, even in spite of the North River ice, which was more than usually heavy during the winter of 1892-93. There were only three days when ice absolutely prevented the continuance of operations.

The first intention as regards part of this work was to have it done by contract; and the reef south of the outer end of the pier being the one discovered first, was let, after asking for prices, to E. R. Lowe, a submarine contractor and wrecker, at a lump sum price

*Condensed from a paper read at the Niagara Falls Convention of the American Society of Civil Engineers.

which amounted to about $25 per cu. yd. of rock (measured in place). Work was commenced under this contract on July 25, 1892. The plant the contractor used consisted of two platforms which had not been built expressly for this piece of work, but had been used previously in the removal of rock to a depth of 15 ft. below low water. The platforms were built with loose decks, carried on 3 × 10-in. beams, spaced about 3-ft. centers, the platforms being in size about 18 × 20 ft. When floating on their pontoons, the corners of the platforms overhung the corners of the pontoons, and at each of the four corners of the platforms were boxes braced with knees to the two side timbers of the platforms. Through these open boxes passed 8 × 8-in. yellow pine spuds 55 ft. in length, forming the standards or legs of the platforms when they were in position and ready for work.

These platforms were floated into position on pontoons and then the spuds were dropped through the boxes, by means of a floating derrick. After the spuds had been thus placed, differential pulleys were fastened to the tops of the spuds and to the corners of the platforms, and by means of these pulleys the platforms were raised from their pontoons which, when thus cleared, floated from beneath.

In general, the platforms were located about 3 ft. above high water. It will thus be seen that when located over the low portions of the reef, these platforms stood on 8 × 8-in. legs, over 40 ft. in length, and without bracing of any description. It was afterwards found that the platforms shifted up and down stream, according to the flow of the tide, about 3½ ft. from the true position when the legs were vertical. The drills used by Lowe were of the largest size of the Ingersoll and Rand make, and were the same in size as those afterwards used by the Department. No uniform size of drill bar was used, as all the material was old stock, the size of the drill bars varying from 2 to 3 ins. in diameter. All the drills were turned down so that they fitted into 1½ ins. diameter standard chucks.

All the drilling was done without any particular system, and no plans were kept of the location or the depth of the holes drilled except by the Department. The party doing this work made an effort at first to connect the holes drilled and charged by means of the diver on the bottom. The effort was not successful, however, and three days were wasted, without any result except the losing of the holes. Afterward all connections between the wires leading to the holes were made on the surface of the water. When blasts were fired, powder and tools, which were kept on the floating derricks, were moved about 100 ft. away from the area blasted. Large amounts of powder were used in the first operations on this reef, as the pier not having been widened at the time the work of blasting was going on, it was possible to use much more powder than was found safe in later operations which came close to the widened pier. In one case 300 lbs. of Hecla powder, which is said to contain 40% of nitro-glycerine, was fired at one blast. A perceptible shock was felt on the pier 200 ft. away, and the water was thrown about 40 ft. in the air. As large blasts as this were not allowed again.

At first it was attempted to remove the blasted rock by divers, and about 85 cu. yds. were so removed, a daily average of 3 4-10 cu. yds. being raised by ten men and two divers.

This work being considered too slow, the small dredge "Hussar" was placed at work dredging the blasted rock. This dredge had been built expressly for the recovery of the supposed sunken treasure that went down in the British ship "Hussar," in Long Island Sound, during the period of the Revolution. The dredge was built to operate in very deep water, and was said to have dredged successfully in water 200 ft. deep.

The bucket of the dredge had a capacity of about 2 cu. yds., and was opened and closed by hydraulic power, a small rubber hose carrying the water from a pump on the scow to a hydraulic cylinder which formed part of the bucket. After a trial this dredge was found to be not very well adapted to the dredging of the blasted rock. The bucket being light and also being without poles, and more or less topheavy on account of the heavy cylinder situated near the top and hinge of the bucket, caused it to fall over after it struck the uneven blasted rock on the bottom.

This dredge worked continuously from Nov. 7 to Nov. 15, and in that period excavated and removed about 116 cu. yds., scow measurement, or an average of about 18 cu. yds. per day. After this dredging was finished, drilling and blasting were recommenced and continued to Dec. 28, 1892, when the work was abandoned by the contractor.

When it became evident that the work of the removal of the reefs around pier new No. 14 could not be finished by the contractor who had taken the work on one reef, the Department took the matter in hand, and constructed a drill float for further operations, it having been decided to remove the reef on the north side of and near the outer end of the pier, and the one lying south of and close to the inner end of the pier, by Dock Department labor. A single drill float had previously been used in the removal of rock to a grade of 14 ft. below mean low water, on the East River. The governing idea in the construction of the large four-drill float was to use as much as possible the class of material which, when it should be taken apart, could be used again in the bulkhead wall construction. With this end in view 12 × 12-in. spruce timber was used in the construction of the float itself. This timber was found to be exceedingly buoyant, and from actual trial the buoyancy of 1 cu. ft. was found to be about 33 lbs. After the operations of removing the rock were completed and this drill float was taken apart, the timber was not found to be at all water-logged, although it had been continually immersed in water for more than one year. The dimensions of the drill float were about 22 × 33½ ft., deck measurement, and 6 ft. in depth. Four drills were located on the float, operating through well holes, each of the drills being capable of drilling a hole 12 ft. in depth without changing the drill or the drill bar. The drills were raised and lowered in ways by two men operating a hand winch. Two Ingersoll and two Rand drills were used, the drills being fastened to a 6-in. cast iron column, by means of the standard mining attachments, with only a few additions to enable the drill to be kept in a vertical position without turning. In drilling a hole the drills were fed by the hand feed until the feed was run out, when the winches were called into requisition, the drills lowered, the hand feed raised, then operations continued as before.

It was thus possible with this machine to drill the holes to the required depth, without change in the drill or drill bar, unless for other reasons than the deepening of the holes. In order to hold this drill float steady against wave action, and also against tidal rise and fall, four anchors were used, which consisted of ordinary pile-driver hammers, weighing about 3,000 lbs. each. The drill float was accompanied by the standard Dock Department 12-ton derrick, containing two 40-HP. boilers, and having a single mast with two booms. In locating the drill float, the derrick lifted the four pile-driver hammers, the hammers being rigged in couplets, two for each end of the float. After the hammers were clear of the bottom, the derrick and float alongside were floated into the desired position over the reef, and the hammers were let go and cast free from the booms of the derrick. Other lines from these hammers, or anchors, which ran over the pulleys at the corners of the drill float, were then made fast to the hand winches, and the whole float was hauled down by means of these winches, until the deck of the float stood about 1 ft. or 18 ins. above the surface of the water. Connections now being made from the boilers on the derrick to the steam rock drills, the operation of drilling could commence from what had become a fairly stable structure. Where these operations were conducted and during the period of time which they covered, there was considerable high wind and a large amount of ice, the waves oftentimes rising to a height of over 3 ft. along the side of the pier, and washing over the deck of the float. At one period, about the latter end of December, this drill float operated surrounded entirely by ice over 6 ins. in thickness.

The drill bars used by the Department consisted of two pieces of octagon steel 1½ ins. in diameter, and when joined together, made a total length of 4½ ft. The two pieces were ordinarily of about equal length, one piece, the extension bar, having welded at one end the ordinary standard drill chucks, and the other end being turned so as to fit into the chuck of the drill; the lower length of the drill bar formed the drill proper, one end being fitted into the chuck on the extension bar and the other end being upset and formed into a drill point with a diameter of 3 ins.

In drilling into an 8-ft. hole the diameter of the drill decreased to 2½ ins., and sometimes, in especially hard rock, to 2¼ ins diameter. Toward the close of the work when the holes in the chucks had become considerably worn, difficulty was found in making the connections tight, both at the drill and at the end of the extension bar, and had the work gone further, a more positive chuck, not depending on the friction of a key, would have been made. The drills were operated with a steam pressure of 95 lbs. per square inch at the drill.

Rack-a-rock powder was first used on one reef, the charges being placed directly in the holes without the intervention of tin tubes, the holes where this powder was used being situated in that portion of the reef that was first pumped clean. Difficulty arose in the use of this powder, however, the divers claiming that it did not throw out the rock, and quite a number of charges burning without exploding. Where this occurred, the cartridges containing the exploders either partly or entirely burned, and the remaining cartridges or sausages, had to be removed by the diver.

After 420 lbs. of this powder had been used, the use of nitro-glycerine powder was commenced. That known as forcite powder, containing, it is stated by the maker, 60% nitro-glycerine and 40% of a patented mixture of wood pulp, gun cotton and nitrate of soda, was the first used. The burning of the powder in the hole occurred afterwards with the forcite powder, but it was traced to the use of poor exploders that had been bought in haste and had probably been kept in stock some time.

After using a small quantity of this 60% forcite powder, what is known as forcite gelatine was used, and nearly the entire remaining work done by the Department was with this powder. Gelatine is claimed to contain about 95% of nitro-glycerine and 5% gun cotton and some other absorbent. It was claimed to be extra safe on account of the difficulty of exploding it, the makers claiming that this difficulty was so great that the exploders should always be placed in a cartridge of the lower grades, say, 40 or 60% powder. There was no difficulty, however, when a double-strength exploder was placed in the gelatine itself. In the use of this powder, however, it was found that a weak exploder would simply set the powder burning, with slow combustion, a dark, reddish gas being evolved, which smelled not unlike chlorine. In some of the holes the entire charge burned out in this way, while in others the cartridge containing the exploder, and sometimes only a portion of this cartridge would burn. All of these charges that burned slowly in this way occurred in the reef south of the in-shore end of the pier, and with a particular lot of exploders that were afterwards found to be poor.

One of the difficulties in the use of this nitro-glycerine powder is the fact of its freezing and becoming unreliable at a temperature lower than 42° Fahr. This necessitated the keeping of a fire in the powder house.

In this case a small range was placed in the powder house, which was a 10 × 10-ft. structure placed on a scow, the house being covered on the outside with tar-roofing paper, and the temperature inside kept constantly between 65 and 75°. During the cold weather the powder always arrived in a frozen condition, and the thawing out was done by immersing a galvanized iron bucket filled with the gelatine cartridges in a tub containing water that had been heated on the range to a temperature of not above 100° Fahr. There seems to be considerable doubt as to what is the dangerous temperature of this powder, some people who had used the gelatine claiming that it would stand 200°. No difficulty, however, arose in its use, limiting the temperature as stated, and the powder never became so soft as to run and become unmanageable. Using the bucket and the water in this way none of the cartridges ever came in contact with either the hot water or any hot metallic surface. Owing to the large amount of handling which has to be gone through with in using the powder which has become frozen, the cartridges, which were 2½ and 2¼ ins. in diameter and 8 ins. long, were wrapped carefully in extra heavy paraffine paper before being sent from the factory, and this paper was never opened, except in the case of the one cartridge into which the exploder for each charge was inserted.

In order to keep track of the holes for the subsequent blasting, and to enable the men on the surface to know the location of those that were being charged, wooden plugs were made with the number of the hole cut into them, and with a hole through the axis, in which was inserted an iron rod ½-in. in diameter. As soon as the holes were drilled, these plugs, with the iron rods through them, were inserted in the holes in the rock and tamped firmly in place by the divers. In the charging of the holes afterwards a diver was dropped down about over the spot where the holes to be charged were supposed to be located, and he removed the plugs of the nearest holes and sent them to the surface. It could then be readily seen whether he was located on the bottom correctly, and also whether he was charging or cleaning out the holes intended.

The dredging of the blasted rock was very disappointing. All kinds of buckets were used, including the scoop, clam-shell buckets in two different sizes, 4 and 7 yds. capacity, and the grapple. There was little or no perceptible difference in their effects. On the first day the dredging was done on the reef south of the outer end of the pier; fairly satisfactory work and progress were made, 100 cu. yds. being excavated and put into the scow. The writer thinks it probable that this progress was possible because E. B. Lowe had made a large number of surface blasts, the charges being supposed to be placed in holes, and the rock was powdered pretty well all over the top of the reef, and no difficulty was experienced in its removal.

In one case, directly after the dredge had been stopped because it was doing work of little or no consequence, 30 cu. yds. of stone were sent up by the divers, who simply loosened the stone on the bottom with their bars, the broken stone having formerly lain in such a position that the dredge buckets simply skimmed over the top. It would seem as if part of the explanation of the slow work done by the dredge lies in the fact that the rock would be best operated on by a machine using the

scoop, and in the fact that there is no machine, so far as the writer is aware, certainly none in this vicinity, capable of operating a scoop in a 40-ft. depth of water. Extensive alterations would have to be made in the rig of the machine in order to get a greater horizontal thrust to the scoop. The dredge employed on this work was one of the largest in this harbor, but to rig it to use the scoop, or dipper, for the depth required simply meant the extension of the dipper handle, with no increase in the overhang of the boom, which would cause an increase in the vertical component of the force exerted by the chains, and a consequent decrease in the thrust or horizontal component of the force.

This dredge, like others in the harbor, is built to operate and to dredge to a depth of 25 ft. below mean low water, but, though dredging may be done with it to a depth of 30 ft. in mud or sand, the increase to 35 and 40 ft. and the operations being confined to rock were conditions too hard for it to master satisfactorily.

The work was done under the personal direction of the writer as Assistant Engineer of the Department of Docks, of which G. S. Greene, Jr., M. Am. Soc. C. E., has been for a long period Engineer in Chief.

PERSONALS.

Mr. Daniel Williams, Superintendent of Water-Works at Haverstraw, N. Y., died June 27.

Mr. J. D. Evans, Borough Engineer of Scottdale, Pa., has resigned, and will be succeeded by Mr. S. M. Foust, of Connellsville, Pa.

Mr. Virgil Powers, Railway Commissioner of Georgia and Commissioner of Public Works at Macon, Ga., died June 2, at the age of 75.

Mr. W. H. Baldwin, Jr., General Manager of the Flint & Pere Marquette Ry., has resigned to accept the position of General Manager of the reorganized Richmond & Danville Ry.

Mr. T. W. Kennan has been appointed Superintendent of the Central Division of the New York & New England R. R., with office at Providence, R. I., vice Mr. G. W. Offut, resigned.

Mr. David Little, County Surveyor, was killed at Fairmont, W. Va., June 27. He had taken shelter under a freight car during a heavy storm, and a switch engine moved the car and crushed him.

Mr. W. M. Patton, formerly Chief Engineer of the Mobile & Birmingham and the Louisville, St. Louis & Texas railways, and well known to engineers as the author of "A Practical Treatise on Foundations," and of various papers on the same subject published in this journal, is to open an office in Chicago and will make a specialty of foundations, irrigating works and the development of water power for electric transmission.

NEW PUBLICATIONS.

THE EFFECT OF BRAKES UPON RAILWAY TRAINS. By Capt. Douglas Galton, C. B., Hon. D. C. L., F. R. S., M. Inst. M. E. Pittsburg, Pa.: The Westinghouse Air Brake Co. 8vo; cloth; pp. 212; with 24 full-page plates.

The Galton-Westinghouse experiments on the friction of brakeshoes, which have become famous in technical literature, were first presented in three papers read before the Institution of Mechanical Engineers in June and October, 1878, and April, 1879. These papers have long been out of print and only a few copies are in existence in this country. With most commendable public spirit the Westinghouse Co. has recently had these valuable papers reprinted in a neat, cloth-bound volume, and permits us to announce that copies can be obtained by any reputable engineer or railway officer on request. The book is in no sense a trade publication; for as most of our readers are well aware these descriptions of the Galton-Westinghouse experiments are among the classics of technical literature, and the experiments still stand as among the very best information available as to the friction of brakeshoes. A copy of this reprint should be in the reference technical library of every engineering school and every engineering society in the country. We need hardly say that the Westinghouse Co. is deserving of no small credit for its enterprise and public spirit in making accessible to engineers the results of these important experiments.

STATISTICS AND DATA OF THE WATER-WORKS of 194 Cities and Towns in the United States and British Provinces. Compiled from Latest Returns Showing Population, Status of Water-works, Number of Inhabitants Supplied with Water, Cost of Furnishing Same, Number of Taps, Amount of Water Pressure, Cost of Coal, Per Capita Consumption of Water, Number of Meters in Use, Experience in the Use of Meters, and Other Valuable and Useful Information. Supplement to "Water and Gas Review." New York: Water and Gas Review Publishing Co.; 4to, paper covers; six folding sheets; $1.00.

The above title sets forth with sufficient fullness the contents of this publication. With the exception of a summary, on one of the inside pages of the cover, the information presented is tabulated on six folding sheets, each about 24 x 30 ins., the cities being arranged in order of population. The large sheets are made necessary by the lengthy remarks included in the body of the tables. The column headings are given on the first sheet, only, after which corresponding numbers are used. The 194 towns covered range in population from 1,850,000 to 300, municipal ownership prevailing in 101 towns; private in 92, and one plant being owned jointly by the city and a company. Generally speaking, the experience with meters in these towns is reported as highly satisfactory. Of the 194 works included, 124 recommend that meters should be provided when works are built, and considered a part of the plant, while 12 do not so recommend, and 58 fail to answer the question. The range of meter charges per 1,000 gallons in the 194 towns is from 2½ to 80 cts. Some places are included which have only one meter in use. The largest number of meters in any city is 30,000, in New York. Of the 1,425,300 taps in use in the 194 towns, 145,000, or 9.78% are metered.

THE MINERAL INDUSTRY: Its Statistics, Technology and Trade in the United States and Other Countries from the Earliest Times to the End of 1893. Vol. II. Edited by Richard P. Rothwell, M. Inst. M. E. New York: The Scientific Publishing Co.; 4to.; pp. xl + 894; illustrated; $4.

The first annual issue of this publication was reviewed in our issue of April 27, 1893. As was then stated, the work is the development of the annual statistical number which has been published by the "Engineering and Mining Journal" for many years; the statistics being increased to include foreign countries as well as the United States, and so much matter being added of a technical nature that it is really a new work. The minerals are taken up in alphabetical order and their metallurgy, production and methods of marketing are given with such fullness as the economic importance of each seems to demand. All the articles are written by specialists and the whole has been edited to bring about uniformity in the arrangement of the mass of information which has been collected. The volume as a whole is a valuable collection of information and a most useful work of reference, and reflects much credit upon its able editor.

MICHIGAN ENGINEERS' ANNUAL: Containing the proceedings of the Michigan Engineering Society for 1894. Secretary, F. Hodgman, Climax, Mich. 8vo; pp. 191

Besides the report of proceedings, there are a report of the committee on road specifications, several pages of condensed legal decisions, and the following papers: "Compiling Maps," W. G. Fargo; "Quarrying," H. G. Rothwell; "Franklin St. Bridge, Lansing," E. O. Sellers; "Iron and Steel," C. B. Greene; "Indexing Field Notes," G. M. Ames; "Lumbering in Northern Michigan," F. G. Dewey; "Irrigation," A. L. Reed; "Reclamation of Swamp Lands," O. H. Todd; "Ice Boring Machines," Joseph Ripley; "The Swim for Life," W. L. Coffinberry; "Trying to Survey in East Tennessee," Dorr Skeels; "New York State Boundaries," J. B. Davis; "Ohio and Michigan State Line," Jas. Blair; "Wooden Pipe," G. L. Wells; "Good Roads," J. J. Watkins.

EARTHWORK TABLES. Computed by O. R. Young, C. E., and Walter Bryant, C. E., Salt Lake City, Utah.

As the tables referred to are sent us in the form of blue-prints, they are in one sense hardly "publications." The compilers, however, inform us that they will send the set of blue-prints (four tables), to any address on receipt of 50 cts., and we therefore make note of them in this column. These tables are for use in making estimates of earthwork on preliminary surveys when the only data necessary are the depth of the cut or fill and the transverse slope of the ground measured by a clinometer. They can be used for any width of base by deducting for each prismoid the volume of the sub-base prism. The printing on the tables is remarkably neat and clear. The tables are accompanied by an explanation of the formula by which they are computed.

BRICK FOR STREET PAVEMENTS.—An Account of Tests Made of Bricks and Paving Blocks, with a Brief Discussion of Street Pavements and the Method of Constructing Them. New Edition, with a Paper on Country Roads. By M. D. Burke, C. E. Cincinnati: Robert Clarke & Co. 8vo; paper; pp. 108. Price 50 cts.

The first edition of this pamphlet was noticed in Engineering News of April 16, 1892. The additional paper comprises some 20 pages and appears to be a sensible treatment of the subject, the author appreciating the fact that the amount of money which can be expended on country roads bears a direct relation to the traffic on the roads, and the ability of those benefited to pay for road improvements.

THE VALUE OF TIE PLATES IN TRACK REPAIRS: An Analysis of the Dimensions, Form and Functional Purpose of Tie Plates. By Benjamin Reece, Chicago: The Q. & C. Co. 8vo; pp. 64; illustrated.

This is a reprint of a paper read by Mr. Reece before the Buffalo Association of Railway Superintendents in April, and goes very thoroughly into the subject. Its main purpose is, of course, to advocate the use of the Servis plate, but it deals so fully with the action and effects of metal tie plates in general that it is an important addition to track literature, and should be read by all interested in track improvement and economy of maintenance.

VANDEGRIFT'S UNITED STATES TARIFF. F. B. Vandegrift & Co., 27 William St., New York city. 16mo; pp. (?); $1.50.

From the announcement and sample pages of this work we gather that it is to be a digest of the new tariff bill, and that it will be published within 72 hours from the signing of the bill by the President. May its publication not be delayed!

TRADE PUBLICATIONS.

MACHINERY AND TOOLS. Beaman & Smith, Providence, R. I. 16mo; pamph.; pp. 34; illustrated.

This is a small descriptive catalogue of the more important tools manufactured by the above firm which has been issued preliminary to the complete catalogue now in preparation. Fifteen different sizes and types of milling and boring machines and lathes are illustrated and briefly described. The catalogues closes with a convenient table for finding the number of revolutions giving periphery speeds of from 5 ft. to 50 ft. per minute for diameters of from ½ in. to 20 ins.

HIGH DUTY PUMPING ENGINES.—Facts and Figures Regarding the Operation and Cost of Repairs of Engines Built by the Holly Manufacturing Co., Lockport, N. Y. Second Edition. 8vo; pp. 74.

This pamphlet is made up of letters from various water-works officials, regarding repairs to pumping engines made by this company. The figures are also presented in tabular form together with the capacities, head overcome and leading dimensions of the various engines in question.

CONCRETE MONOLITHIC CONSTRUCTION. Ransome & Smith Co., San Francisco, Cal. 12mo; pp. 88; illustrated.

This interesting little pamphlet describes the construction of buildings of monolithic construction, including the Library at Leland Stanford University, the construction of which has been described and illustrated in our columns. Concrete for well lining, railways and cable conduits, floors, etc., is also included, as is the combination of concrete and twisted iron.

SIGNALS. Auto-Pneumatic Railway Signal Co., Rochester, N. Y. Oblong; 8vo; pp. 36; illustrated.

This is a descriptive catalogue of the company's low pressure pneumatic interlocking signals, the pressure used being only about 10 lbs. per sq. in. No electric appliances are used. A plant put in by this company was described and illustrated in our issue of Dec. 21, 1893.

POHLE AIR LIFT PUMP.—Alex. E. Schnee, Agent, Postal Telegraph Building, New York. 40 pp.

This little pamphlet sets forth the advantages of this novel pump, which is used for pumping water from deep wells. The pump and the theory of its action were described and discussed at length in Engineering News of June 8, 1893.

BRASS WATER AND GAS FITTINGS. Peck Bros. & Co., New Haven, Conn. Pp. 73.

This illustrated and priced pamphlet will be convenient for purchasers of bibbs, cocks, nipples and similar brass goods.

SOCIETY PROCEEDINGS.

NORTHWESTERN ELECTRICAL ASSOCIATION.—The summer meeting of the association will be held at St. Paul, Minn., July 18, 19 and 20. Henry C. Thom, of Madison, Wis., is secretary.

COMING TECHNICAL MEETINGS.

TECHNICAL SOCIETY OF THE PACIFIC COAST.
July 6. Secy., O. Von Geldern, 719 Market St., San Francisco.
NORTHWEST RAILWAY CLUB.
July 10. Secy., W. D. Crosman, Ryan Hotel, St. Paul.
DENVER SOCIETY OF CIVIL ENGINEERS.
July 10. Secy., F. E. King, Jacobson Block.
NORTHWESTERN SOCIETY OF ENGINEERS.
July 10. Secy., D. W. McMorris, Burke Blk., Seattle, Wash.
WESTERN SOCIETY OF ENGINEERS.
July 11. Secy., Thos. Appleton, Lakeside Bldg., Chicago.
ENGINEERS AND ARCHITECTS' CLUB OF LOUISVILLE.
July 12. Secy., G. W. Shaw, Norton Building.
CANADIAN SOCIETY OF CIVIL ENGINEERS.
July 12. Secy., C. H. McLeod, Montreal, P. Q.
ASSOCIATION OF ENGINEERS OF VIRGINIA.
July 14. Alleghany Springs, Va. Secy., J. A. Pilcher Roanoke, Va.
MONTANA SOCIETY OF CIVIL ENGINEERS.
July 14. Secy., G. O. Foss, Helena.
ENGINEERS' CLUB OF KANSAS CITY.
July 16. Secy., Waterman Stone, Baird Building.
WISCONSIN POLYTECHNIC SOCIETY.
July 16. Secy., M. F. Schinke, City Hall, Milwaukee.
ENGINEERS' CLUB OF MINNEAPOLIS.
July 16. Secy., E. Nexsen, 504 Kasota Block.
COLUMBIAN ENGINEERING SOCIETY.
July 17. Secy., F. W. Hart, Washington, D. C.
BOSTON SOCIETY OF CIVIL ENGINEERS.
July 18. Secy., S. E. Tinkham, 36 Bromfield St.
SCANDINAVIAN ENGINEERING SOCIETY OF CHICAGO.
July 19. Secy., Howard Berge, 100 Washington St.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.
July 19. Secy., Daniel Carhart, Carnegie Lib. Bldg., Allegheny.
TACOMA SOCIETY OF ENGINEERS AND ARCHITECTS
July 20. 201 Washington Building.

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D. McN. STAUFFER, A. M. WELLINGTON.....EDITORS
CHAS. W. BAKER, E. E. R. TRATMAN, M. N. BAKER.....ASSOCIATE EDITORS
GEO. H. FROST.....BUSINESS MANAGER.
F. P. BURT.....ASSISTANT MANAGER

CHICAGO OFFICE: 1,636 The Monadnock.
CHAS. S. HILL.....RESIDENT EDITOR.
F. A. PECKHAM.....ADVERTISING MANAGER.

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Several correspondents call our attenton to an error in our article on jet propulsion (p. 522, Engineering News, June 21). The theoretical thrust or reaction of a jet on the vessel from which it issues is equal to twice the section of the jet multiplied by the unit pressure, or double that taken in our computation. Thus the thrust exerted by the jet on the "Evolution" under the conditions stated by Dr. Jackson was 1,202.64 lbs., instead of 601.32 lbs.; and, assuming as before, the claim of 10 knots speed to be correct, the work done on the vessel was 36 HP., against 420 HP. lost in the jet. For an excellent explanation of the principles involved in computing the reaction of a jet, see Prof. I. P. Church's "Mechanics of Engineering," pp. 798-800.

Ice as an obstruction to water-works intakes is a familiar trouble to many water-works officials in Northern cities and a difficulty to be guarded against by engineers designing works for such localities. The intake for the private water-works plant of the Standard Oil Co. at Whiting, Ind., described elsewhere in this issue, is an interesting attempt to avoid trouble by having three supplementary inlets located some 40 ft. from the main intake, in different directions, and connected with it by pipe laid on the lake bottom. In our issue of June 27, 1891, an arrangement for keeping an intake clear of anchor ice by means of compressed air, in use at Chicago, was illustrated and described and in our issue of March 30, 1893, a rotary strainer, invented by Mr. J. G. Falcon, in use at Evanston and Metropolis, Ill., and Paducah, Ky., was shown. In our issue of July 20, 1893, we illustrated a hinged intake at Jackson, Miss., which it was suggested might be useful in this connection.

In the article on the new line to Buffalo and the Buffalo terminals of the Lehigh Valley R. R., in our issue of June 21, it should have been stated that the terminal system was constructed under the direction and supervision of Mr. A. W. Stedman, formerly Chief Engineer of the Lehigh Valley R. R. The design for the Cheektowaga stocking grounds was the suggestion of the late Mr. Wm. Stevenson, and the plans were prepared by Mr. Kielland under Mr. Stedman's direction. The original plan of the Tifft Farm terminals was the work of the late Mr. Frederick Mercur, but the entire charge of the work was under Mr. Stedman, who also directed the preparation of the plans for the Buffalo yard, engine house, machine shop, etc.

What is the horse-power of a boiler? This is a question which is continually recurring and one over which much good ink and wise words have been spent with very small result. We do not propose at the present time, however, to enter into a long discussion of the boiler rating question. It may as well be admitted, on the one hand, that the horse-power is an arbitrary unit for boiler rating, and, on the other hand, that no other unit based on either area of heating surface or grate surface, or pounds of water evaporated in a given time, can be made to mean to the non-technical man what the horse-power unit means.

Bearing these facts in mind, we wish to call attention to a very simple, easily memorized and easily used rule for computing the horse-power of a boiler which was recently worked out by a member of the staff of this journal. The rule is applicable to all classes of tubular boilers except the Scotch and the locomotive types (internally fired), and is applicable to water-tube boilers as well as to the fire-tube types. It is as follows:

Multiply the number of tubes by their length in feet and by their nominal diameter in inches and divide the product by 50. The quotient will be the horse-power of the boiler.

Of course this rule, being made to be applicable to so many various types of boilers, cannot lay claim to any great accuracy; but except where a contract is involved, nobody has any use for any accurate measurement of the horse-power of a boiler; a difference of 5% or so either way is of no consequence whatever. It will be found, moreover, on trial that this simple rule hits surprisingly close to the figure which more elaborate calculations will give. It was originated from the externally fired return tubular boiler, the shell heating surface being ignored and a little higher value being given to the tube heating surface to make up for it. In a water-tube boiler there is no shell heating surface; but to offset this the outside of the tubes instead of the inside is exposed to the gases, and the lower tubes are heated directly by the fire. In a vertical boiler we have instead of the shell heating surface, the surface of the firebox, and smaller and shorter tubes are used which make the rule give very close results. For the Manning and Reynolds types of vertical boilers, in which very long tubes are used, the results given will be of course somewhat in excess of the ratings ordinarily taken.

It has long been the dream of some of the labor agitators that if all the men who work for wages could once be combined in one organization, they could take the world by the throat, so to speak, and say, "Give whatever we ask or all industrial operations shall stop until our demands are complied with." The action of the newest of railway labor associations, the American Railway Union, taken during the past week, has been enough of a foretaste of this state of affairs to be viewed in a very serious light.

The fact is, and it may as well be faced, that the labor organizations possess a power and a solidarity which are dangerously underestimated by too many men in positions of authority. It is probably true that a very large proportion of the railway employees of the country are law-abiding and honest citizens. One is loth to indict the whole body of railway employees in the country, little short of a million in number, as upholding and defending so unreasonable and unjust a strike as that which is now going on.

It seems reasonable to suppose that two-thirds at least of the railway employees of the country would oppose such a strike as that now in progress were they entirely free to act according to their preferences. But in these matters the radical minority is apt to take the lead, while the conservative majority stifles its convictions and follows with blind obedience the leaders. Further, in every such conflict of capital and labor, there are unfortunately too many firebrands from the semi-criminal classes, who will seize the opportunity to destroy property and commit violence of every sort, thus widening the breach between the officials in charge of railway properties and the body of employees under them.

It is interesting to reflect during this period of tumult and conflict that there was a time, less than a score of years ago, when the railways were on top, and very much on top. Those were the days when railway officers lived sumptuously on princely salaries, and ran the properties in their charge to suit themselves. In those days the favor of a high official was worth a handsome sum, and it generally took that for a favored shipper to secure it. As for the employees, they did as they were bid, or got their walking papers. No one would have ventured at that day to predict the vast revolution that has taken place. The pendulum has swung to the other extreme. Rates of fare and freight have gone down to a point which, on a large proportion of the mileage of the United States, leaves little or nothing as a return for the capital actually invested after the operating expenses and the actual depreciation of the property are met. And when the rates are once down they stay down, for the railways are now as sensitive to public opinion as they once were callous, and do not care to invite new avalanches of restrictive legislation by putting up rates, even when actually unremunerative. As for the employees, as the latest great strike shows, they attempt to dictate, not only rates of wages, hours of labor, and who shall or shall not be discharged, but even take the ground that if they have a "grievance" against any party, their employer must, on demand, cease all dealings with that party and break all contracts that may be in force with him, regardless of legal or moral obligations or of common justice. It is difficult to find words sufficient to characterize the absurdity of this position. The labor agitators themselves can justify it only on the plea that any measure which will aid them to gain their ends is justifiable, and iniquitous as such a position may seem to the dispassionate observer, we must realize that this reason is accepted as sufficient by the great bulk of men who work for wages.

The question which is heard everywhere is, where shall a permanent remedy be found for these incessant conflicts? It is idle to hope for a solution by the use of force. Necessary as the use of troops and marshals may be in the present emergency, it is to be deplored for the lasting results in the hatred it arouses for law and order, and the gulf of ill feeling that it creates between employer and employee. We can only hope for a permanent solution of these serious problems by some radical change in the methods of employing labor and in the tenure of positions, and such a change must bring with it a better feeling between employer and employed, that will make impossible such wanton injuries of each by the other as are now so common.

The new Panama Canal company, which has been formed in France, as noted in our news columns, hardly seems to be deserving of much encouragement, even by those who yet believe in the feasibility of the Panama project, if the press reports regarding the personnel and organization of the company are to be credited. The capital of the new company, according to these reports, has been obtained from bankers, engineers, contractors and other persons to whom large sums of money were wrongfully paid by the old company, who have been coerced into subscribing for the stock by threats of legal proceedings against them. It is needless to say that investors obtained in this manner can hardly be depended upon to stand by the project any longer than fear of the law compels them. Their chief interest, indeed, will be to cast discredit upon the project and undermine the confidence in the good intentions of the company, so that its collapse may free them from any further demands on their purses. The initial capital of $12,000,000 will suffice merely for the resumption of the work. This will, of course, prevent the canceling of the concession already prolonged twice by the Colombian Government, but will not ensure much substantial progress toward the completion of the canal. It is possible that this was the principal object for organizing the company on its present basis, and that the promoters of the canal

project hope that the resumption of work will interest bona fide investors with sufficient capital to carry the work to completion. It is difficult to say just how much basis there is for such a hope, but the disgraceful exposures of the old company's methods of doing business should have a tendency to cool the enthusiasm of even the most patriotic of Frenchmen. To the outsider, all that the organization of the new company seems to promise is a possible further waste of money in the Panama ditch. The original Panama company alienated the support of every intelligent capitalist by beginning its stupendous enterprise without any definite and detailed plan for carrying it to completion. Apparently this new company is merely repeating the folly of its predecessor. If the Panama isthmus is ever cut, it will be done by first conceiving an intelligent plan for the execution of the work from start to finish, and then securing sufficient capital for the work on the strength of that plan.

SUPPLY AND DEMAND IN THE ENGINEERING PROFESSION.

During the month that has just closed the annual commencements of most of the technical schools have taken place. The graduates of 1894 have made their exit from the little college worlds in which they have dwelt so pleasantly to enter their places in the busy, working world. But they find, in the majority of cases, we fear, that the busy, working world is very loth to grant them the desired places. Not for very many years has the annual crop of engineer graduates been put upon a market so overstocked. When engineers of experience and reputation—civil, mechanical and electrical alike—find it difficult to secure new engagements, what chance has a young graduate, unless aided by powerful influence or ready means?

In another column of this issue we present a number of articles on the engineering profession and its status, taken from various sources. We publish these statements and opinions as an interesting exposition of the different ideas now prevalent on this subject, and do not by such publication intend to convey either approval or disapproval of any of the various opinions expressed.

The statements which we print, however, do certainly give rise to some interesting questions, which may be discussed with especial appropriateness at this time when the already overstocked engineer market is in receipt of a fresh consignment.

The discussion in "The Engineer," which we reprint, refers, of course, to conditions in England; which are, however, not so dissimilar to those here as to rob it of interest. It was started by a letter in which the writer charged that the multiplication of technical schools was the cause of the over-supply of engineers. The same charge has been made in this country. It is worth while to see what foundation there is for it.

In the first place, it is familiar knowledge that the past thirty years—we can almost say the past twenty—have witnessed an enormous revolution in our whole system of higher education. Down to 1860, the work in all our colleges was modeled on the old system of classical studies, a system whose spirit of antipathy to the practical and useful was only less in degree than that which animated the scholastic philosophy of the Middle Ages. The reaction from this time-honored system has been extreme, and it has resulted not only in the establishment of the physical sciences as a chief element in our system of education, but in the foundation of that long list of technical schools of which we are so justly proud.

For many years the patronage of the technical schools was limited, through a general impression that the education they gave was in some way inferior to the education afforded by the study of classical literature. That day, however, has passed. There is a constant demand now, on the part of the public, for immediate practical results from the higher education. There are hundreds now who will afford to give their children "the advantages of a college education," where there were tens a score of years ago; and their demand is constantly for something which shall fit the student for usefulness as soon as he leaves the college doors.

It is not strange at all that this demand from the public has arisen, when we remember that for years our public works and industrial enterprises developed faster than competent engineers could be secured to carry them on. During the years of rapid railway extension, it was a common thing in colleges where railway field work was well taught for students to obtain positions at $100 a month as transitman or leveller, even in advance of their graduation, so scarce were good and reliable men in proportion to the demand. The growth of civil engineering schools soon made the supply quite equal to the demand, and then attention was turned toward mechanical engineering, the schools of which were much later in starting than the schools of civil engineering. Graduates from these schools—or we will say from the best of them—had little difficulty in finding lucrative positions or in soon working into them, for a number of years, but it is by no means so easy now. Latest of all have come the special schools of electrical engineering; and it would be comical, had not the case a pathetic side, to see the public's blind worship of electricity reflected in the number of students who have swarmed to the schools of electrical engineering that have sprung up so quickly in the few years since the electrical industries came into being. As a result of this, there is probably a greater surplus of electrical engineers in proportion to the demand for their services at the present time than there is of either civil or mechanical engineers. As an extreme example of what this condition of affairs has brought about, we reprint in another column a quotation from our contemporary, "The Electrical Engineer," wherein is related the case of an electrical engineer who did work worth at a guess some $500 and received as a fee the munificent sum of $25!

Is, then, the multiplication of technical schools responsible for the present surplus supply of engineers as compared with the demand for their services? Certainly it is. It would be as idle to deny it as to deny that the multiplication of blast furnaces during the last part of the '80's is responsible for the present surplus of pig iron in the market. It is indeed lucky for older members of the profession that engineers are made in a lifetime and not in the four years' course of a technical school, or the prices for all engineering services might go down as prices of pig iron have gone.

In saying this, the fact is not overlooked that the technical school, by the training it has given its graduates, has enormously raised the character of the profession—we might almost say that it has made the mechanical engineering profession in this country, and in this way has greatly increased the demand for engineers' services. It is entitled to all credit for this; but there is a limit of course to the increase of demand which can be brought about in this way.

But to say that the technical schools are responsible for the surplus of engineers is not to say by any means that there are too many technical schools or too many students in them. We may as well rid ourselves of the idea that the enterprises of this country can absorb annually the number of graduates which technical schools are now turning out and find employment for them all in strictly engineering work. We must come to look on the courses in the technical school as we look on the courses in the sciences and languages at the older colleges, as a general training of the man to make him enough broader and to fit him enough better for his lifework to be worth the four years required.

It is quite true that this is not the most pleasing view to take of the matter. It would suit so much better one's abstract ideas of justice to have the poor boy, who has worked his way through school and college, step at once into a comfortable income as a reward for his industry and perseverance. But we must face the facts as we find them. Our contemporary, "The Engineer," hits the nail on the head when it says: "After all, only a very small percentage of men owe a good income to an advanced education." It is the fact that if the possessors of any especial sort of knowledge are able to receive incomes above the ordinary on account of it, we shall soon find that a large number of persons have educated themselves in that special sort of knowledge. In fact, the tendency will be to overdo the thing, and the compensation of the persons who have spent time and money to train themselves for that particular vocation may fall below the normal. In other words, there might be fewer engineers now looking for work, had not the engineers who graduated in the '70's been so fortunate in securing employment and advancement.

There probably will be in the future a greater divergence between the trade school and the college of engineering than now exists, accompanied by a clearer understanding of their relative positions in the public mind. The trade school will educate men to be skilled workmen, giving at the same time enough of foundation principles to give them an intelligent interest in their work and to enable them, if they have the inherent capability, to rise to positions of authority and responsibility. The boy without means or friends, who desires an education, will probably find his way to the highest rounds of the ladder more easily through the medium of such a school.

The engineering school, on the other hand, will train its students not only for professional work as engineers, but for positions of trust, responsibility and authority throughout the whole range of our industries. It is the breadth of employment which is opening before the engineering profession that leads men like Mr. Coxe to favor the broadening of the engineer's training school as opposed to its specializing. The special courses have been established in response to the demands of parents, pupils and boards of trustees; but there is much reason to believe that the tendency will yet be in the reverse direction. A man whom fortune may destine to spend his life in charge of flouring mills will not be benefited materially by a college training in railway field work. It were much more important that his training be thorough in the principles of machinery; but it is most important of all that his college training should teach him how to study so that he can solve for himself any prob'em which may be brought before him and master any science or art that may aid his success.

And now it may be worth while to offset the rather discouraging words of the various writers whose views are presented in another column by something with reference to the brighter side.

In the first place, the graduates of engineering schools in the United States have reason to congratulate themselves that, though the profession is overcrowded here, it is by no means so overcrowded as in England, nor is it likely to be while our wealth of undeveloped natural resources remains so great. Comparison between different grades of misfortune is not very substantial consolation, however. Let us look at another aspect of the case. We have pointed out above what to many will seem almost a truism—that very few in these days are reaping any large income merely because of the possession of education. While this is a hard fact for the student, who hopes to make up for deficiencies in personal attainments by his erudition, it should keep a steady hope in the breast of the young graduate who feels that he can add to professional knowledge those personal qualities which are so essential to success. For the fact is, that the qualities which bring success in the engineering profession are the same, to a large degree, as those which win success in any other profession. The man who adds to a thorough knowledge of engineering the qualities of good judgment, pleasing address, the ability to be all things to all men, and above all absolute trustworthiness—he is the man of whom the market quotations always read, "in good demand, supply very scarce and slow in coming forward."

It is but a paraphrase of the old saying, "there's plenty of room at the top," perhaps; but it applies with especial force, we believe, to the engineering profession. For with all our technical schools and our engineers, millions are daily going to waste that might be saved by better and more intelligent work. The tendency to run in a rut is not so strong here as in England—witness the interesting letter signed "Denarius" in another column—but it is very strong here; and the waste that comes from running in ruts is enormous in amount—as every engineer posted on the "good roads" question can testify.

We hear much of the world's losses through vice, but little of the world's losses through ignor-

ance. In our remarks above we may have seemed to depreciate the value of the engineer's practical knowledge, but the fact is that the world stands in great need of this knowledge, although it does not yet realize it. Waste is going on in hundreds of mills and shops which some bright young graduate of 1894 could remedy, had he the opportunity; but the trouble is that the waste is not appreciated; it has been wisely said that the public is not willing to pay for the best the engineer can do.

We cannot close, however, without calling renewed attention to one phase of this complicated question which cannot receive too much attention at the hands of engineers. We refer to the cultivation among engineers of such a sense of professional honor that the profession may acquire the public confidence to a degree that it does not now have. One cannot have failed to notice how frequently the attempt is made to place army engineers on any board or commission where public confidence in the absolute integrity of the body is especially sought for.

This same idea has come to notice in connection with the investigation of those foolish and ridiculous deceptions practiced on the armor plate inspectors by the minor officers of the Carnegie Steel Works. We are glad to say that, so far as we now recall, no mechanical engineer of such prominence as to really deserve the title has been implicated in these transactions; and may the lesson not be brought home to employers that it is worth while to have professional men who have a reputation and know how to value it, in such positions of responsibility?

How such a sense of professional honor may be nurtured in the profession at large it is difficult to say. The technical schools can do much to implant it, the engineering societies can aid its growth. The American Institute of Architects, for example, has as one of its main objects the abolition of the custom of accepting other commissions besides those from clients. The growth of this sense of professional honor among engineers at large may be slow, but it should be steady; for upon it in no small degree the hopes of the profession for both greater honors and better rewards are based.

LETTERS TO THE EDITOR.

THE PHILADELPHIA ASPHALT TESTS.

Sir: I desire, through your valuable columns, to correct a misstatement appearing in an article entitled "Tests of Asphalt Paving Materials at Philadelphia," in your issue of June 21. In that article it is stated that "the California Petroleum & Asphalt Co. made a formal application for an examination of its materials and then withdrew it."

The facts of the case are as follows: The Citizens' Municipal Association of Philadelphia, just before the last letting of street paving contracts, in this city proposed to examine all asphalts likely to come into competition with Trinidad. I had a conversation with Mr. Arthur H. Lea, the chairman of the Citizens' Association, as to the advisability of having the experts of his association make an examination of Alcatraz asphalt.

At the close of that conversation I informed him that I wished to give the matter careful consideration, and would let him know at the earliest possible moment whether I would submit our materials for examination or adopt some other method of demonstrating the superiority of Alcatraz asphalt.

I came to the conclusion that the most effectual demonstration we could make would be the laying of a sample block, and I wrote to Mr. James H. Windrim, Director of Public Works, of Philadelphia, offering to lay such sample block at our own expense. At the same time I wrote Mr. Lea to the effect that we were going to lay this sample block, and consequently I did not think it necessary to have our materials examined by his experts, but that if he wished to examine Alcatraz asphalt I would be pleased to send him samples for that purpose and would do so at once if he would let me know what quantity he desired.

The fact that we have been awarded a portion of the streets in Philadelphia, to pave with Alcatraz asphalt, proves that we did not fear to come into competition with Trinidad, Bermudez or any other asphalt.

Very respectfully, Willard T. Barton,
General Manager California Petroleum & Asphalt Co.
Philadelphia, June 27, 1894.

Sir: Our attention has been drawn to several criticisms of our report on "Asphalt Paving in Philadelphia," a full abstract of which appeared in your issue of June 21, and as our position in the matter is repeatedly misstated, we ask for space to correct our critics in a few respects.

The more elaborate discussion of the report is that of Mr. Clifford Richardson, of Washington, formerly Inspector of Asphalts and Cements for the District of Columbia, and at present, as we are informed, an official of the Barber Asphalt Co. Mr. Richardson says to begin with:

Tests for tensile strength of briquettes of Trinidad and Bermudez asphalt surface mixtures are very deceptive, because the asphaltic cement is but one factor in the physical properties of the briquette and of the result of the test, while the size of the sand, the amount of the impalpable dust in use, and the density of the briquettes are much larger, more important and more controlling elements.

In answer to this, we would say that the sand used in making the briquettes was absolutely of the same fineness, as carefully tested by us and in amount was 58% and 60%, respectively. The amounts of impalpable dust in the Trinidad mixture and Bermudez No. 2 were 27% and 30%, respectively, so that, allowing for the impalpable ash of the Trinidad, the two were almost identically composed, and the density of the two was as nearly equal as an experienced cement briquette maker could make it. As the tests were thrown open to the inspection and criticism of representatives of the two companies interested, as well as to the Director of Public Works, we took every precaution to make the conditions of manufacture and testing of the briquettes absolutely fair to all concerned.

It is entirely beside the subject for Mr. Richardson to say what we might or might not have found if we had tried glance pitch, coal tar, or land pitch. We were not asked to investigate anything but the refined Trinidad Lake asphalt submitted by the Vulcanite Paving Co. and the refined Bermudez asphalt submitted by the Pennsylvania Asphalt Paving Co. We might add that the oil residuums to be used were also simply and alone the two submitted by these companies, respectively. Therefore, our conclusions, (3) and (4), were expressed in very guarded language and not made at all sweeping, as our critics seem to have hastily concluded. The language we used we think fully borne out by the figures of the tests. Further than that we have not expressed an opinion.

Mr. Richardson says again:

It will be seen that the conclusion that the cementing materials which give the greatest strength in bituminous concretes must be the most valuable ones for paving purposes, based upon our methods of interpreting similar tests with hydraulic cement concrete, is entirely incorrect.

To this we would reply, first, that we announced no such theoretical conclusion; and, second, that in the sixth annual report of the Inspector of Asphalt and Cements for the District of Columbia, the writer (Mr. Clifford Richardson) says on p. 42:

Upon the presence of this oil or soluble bitumen the viscosity and cementitious value of the pitch largely depend, but at the same time it is found that adding asphalt oil to pitch in which it is deficient does not restore or renew the properties which have been lost.

And on p. 46:

To the petrolene the Trinidad pitch owes its cementitious value and the larger the proportion, the better the pitch, as has already been shown.

With regard to the question of the rotting of the paving composition in the gutters and when continuously wetted with water, we spoke of the "experience in Washington," not meaning thereby our observations in Washington, which were very limited, but that of the District officials (of whom Mr. Richardson was one) and quoted from them. We made, it is true, some laboratory experiments with paving composition, but were careful to specify them as such. We have, however, made observations in the streets of Philadelphia, and the same can be made any day by visitors, which fully justify us in saying that asphalt paving compositions do disintegrate and rot in the gutters.

Mr. Richardson says, in conclusion, that he, "with many years' experience with asphalt and a two-years' study of Bermudez material, would not be willing to draw such sweeping conclusions in regard to the two materials as the Philadelphia experts have done from the experience of a few weeks." We beg Mr. Richardson to read over our summary again and to state where these "sweeping conclusions" are found. Items (1) and (2) state analytical facts which Mr. Richardson has already agreed to in his printed reports; items (3) and (4) deal with specific mixtures which were tested. Mr. Richardson says in the last paragraph of his letter of criticism: "Under what conditions Trinidad or Bermudez asphalt pavements can be or are laid in Philadelphia, I am at present unacquainted"; had his experiments been made on the same materials and under the same conditions, we feel certain we could have been more nearly in accord. Item (5) we have already spoken of; the language is hardly to be called sweeping. Nor does our final recommendation seem to be a sweeping one. We merely ask that, in view of our studies of these materials, the committee urge upon the municipal authorities the opening of sheet asphalt paving in Philadelphia to parties using Bermudez asphalt, under the same guarantees as are exacted from those using Trinidad asphalt.

The other criticism is by Mr. H. C. Bowen, who combines with his position of "Tutor in Quantitive Analysis" in Columbia School of Mines the duties of chemist of the Barber Asphalt Co.

This gentleman indulges much more in innuendo than in legitimate criticism. We shall therefore be very brief in our reply to him.

He begins by saying "the report seems in part to have been piloted by interests other than independent and scientific investigation." We reply that the insinuation is absolutely untrue. The reasons why the Bermudez company seems the chief beneficiary of the work are stated by the Citizens Committee and by ourselves in the report.

Mr. Bowen says: "It is not a proper conclusion by these experts (in other matters than asphalt) that one asphalt is better than another, because soluble to a greater degree in bisulphide of carbon." What we said was: "The absence of much mineral matter makes it possible for the Bermudez asphalt to make more paving composition than the Trinidad asphalt, taken ton for ton." It does not take an "asphalt expert," so-called, to decide that material containing only 1.50% ash and 97.22% bitumen is cheaper than another containing 34.51% of ash and 61.50% of bitumen.

Mr. Bowen concludes his criticism of the chemical work of the report by saying: "the chemical analyses and data given, beginning with 'specific gravity' and ending with 'flowing-point,' seem to have been incorporated from those of the chemist of the Bermudez company and not to have been made by any one of the experts of this report." Is this Mr. Bowen's idea of scientific criticism? While we have both taken part in scientific discussion and controversy at various times in past years, we do not recall any that started off in such a way and must respectfully decline beginning any such now. We would say that we have full analytical data for all our published results.

We will only note one point more of Mr. Bowen's remarks. He says: "Rotting of Trinidad pavement is scarcely known to-day." In this remarkable statement he is contradicted by all the authorities quoted in our report, and we can show him the contrary in a dozen localities in Philadelphia to-day.

Samuel P. Sadtler,
Henry Leffmann.

Philadelphia, June 30, 1894.

THE ENGINEERS OF THE LA GRANGE DAM, CALIFORNIA.

Sir: In connection with the notes referring to the dam at La Grange, Cal., published in your valuable journal for March 29, I beg leave to request that you publish the following names of engineers connected with this important work. The matter was overlooked in the notes that were hastily put together, and it is Mr. McKay's wish, as well as my own, that it be given publication now.

In the early conception of the work, Mr. Luther Wagoner had charge as chief engineer of the Turlock and Modesto Irrigation districts. It subsequently passed into the hands of Mr. Eugene H. Barton and later on to Mr. W. D. Rhodes, as resident engineers, while the construction has been under the immediate and able inspection of Mr. McKay from the foundation to the crest. By giving this note a space in your paper you will greatly oblige,

Yours very truly, Otto Von Geldern.

San Francisco, April 5, 1894.

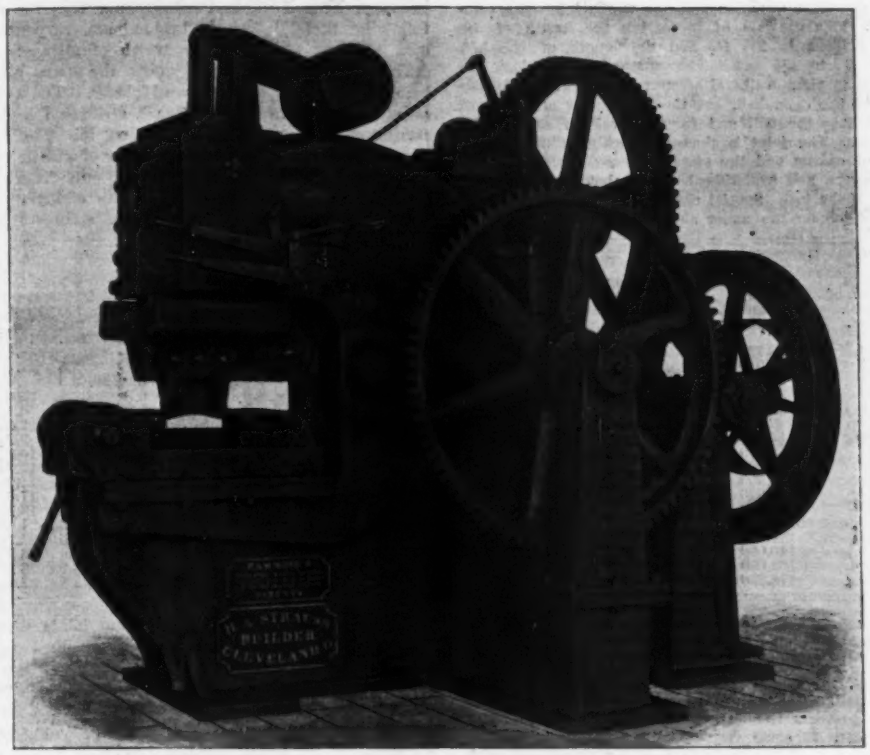
NOTES AND QUERIES.

R. T. N., Attica, N. Y., inquires whether the contractor who agrees to build an embankment at a certain price per cubic yard has to stand the loss in case during the construction a flood occurs and part of the embankment is washed away. This is rather a question of law than of engineering; but on general principles we should say that the contractor would not have to stand any part of the loss unless the washout was due in some degree to negligence or lack of foresight on his part. If the situation was such that floods or washouts were liable to occur, it devolved upon the party who planned the work to arrange protection against such contingencies or else stand the loss if they occurred. Of course if the contractor has taken the work at a lump sum, the courts might hold that he had thereby assumed all the risks attendant upon construction; but as the contract was for piecework, the contractor would seem to be entitled to payment for each cubic yard actually moved.

The Boynton bicycle railway promoters have come out of their long struggle in the Massachusetts legislature with a charter incorporating the Boston & Lowell Bicycle Ry. Co. to construct and operate an elevated and surface bicycle railway between Boston and Lowell under the Boynton patents. The company will be able to take land for its road in the same manner as other steam railways. Under this charter, if the promoters can enlist the necessary capital, there is nothing apparently to prevent the construction of the road.

THE HAMMOND COLD SHEAR FOR STRUCTURAL IRON.

We illustrate in the accompanying cut a belt-driven shear for cutting structural iron shapes, which has been designed and patented by Mr. David Hammond, of Canton, Ohio, President of the Canton Bridge Co., and is manufactured by H. A. Strauss, Cleveland, Ohio. This tool is claimed to have several advantages, chief among which is that the cutting is by direct action, instead of by what is known as the shear cut, thus preventing the cutting blades from becoming heated, therefore increasing their durability. It is especially designed for cutting structural iron shapes and is so arranged that both the web and flanges of such shapes are cut at a single stroke, doing away with any shifting of the piece after it is once in position and enabling a more accurate cut to be obtained. The general design and construction of the tool will be evident from the illustration.



HAMMOND BELT DRIVEN SHEAR FOR CUTTING STRUCTURAL IRON.
H. A. Strauss, Cleveland, O.

50-TON QUARRY CRANES AT LEROUVILLE, FRANCE.

Two 50-ton cranes, or travellers, of peculiar design are used at the quarries of Lerouville and d'Euville, in France. They were made at the works of the John Cockerill Co., at Seraing, Belgium, and are described and illustrated by perspective views in "Le Genie Civil," from which we take the following notes:

The quarries mentioned have been cut down to a depth of from 115 to 130 ft. below the general surface and in places present a vertical face of great height. Blocks weighing from 1,000 to 1,800 lbs. have to be taken from the top of this face and deposited in cars on the tracks at the foot, and this work was formerly done by inclined planes. To avoid the heavy work of continually shifting these planes the cranes here described were built for Messrs. Civet, Crouet and Gautier, the owners of the quarries referred to.

Two tracks were first laid 82 ft. apart vertically, one at the foot of the vertical face and another on the top at some distance back of the face; on these tracks the crane travels, commanding the whole working face. Upon the lower track runs an A frame of trussed construction, tied together at the base and at a point a little more than half way up. Near the top of this A frame, and forming a right angle with it, are two plate girders some distance apart and extending to a smaller A frame running on the upper track, the horizontal distance between the tracks being 98.4 ft. The bottom of these plate girders is about 10 ft. above the level of the rails of the upper track, thus giving abundant headway for working the top of the cut. According to the photograph, the girders extend about 30 ft. outside of the larger A frame, and these girders are supported by four inclined framed posts abutting on the A frame at the center cross truss.

The load is carried by a traveller provided with a hoisting engine and running on the top flanges of the girders. The heavy hoisting sheaves supporting the load pass between the girders and through the top of the large A frame out to the end of the projecting girder arm, and the load is then lowered onto the track below. The load can be lifted at the rate of about 2 ft. per minute, for 50 tons, or 6½ ft. per minute for 20 tons. The load is moved transversely at the rate of 50 ft. per minute, and the whole crane can be moved along the tracks at the rate of 33 ft. per minute for loads of 20 to 50 tons. These three movements can be made at will, separately or together, by means of electric bells communicating with the attendants on the engine on the lower part of the machine. The hoisting cable is made of steel wire and all wheels are of steel, with steel tires. No other details are given in the article quoted.

FORTY YEARS' DECREASE IN FREIGHT RATES, L. S. & M. S. RY.

The enormous and almost continuous decrease in railway freight rates during the last half century is very forcibly illustrated by the accompanying diagram showing the variation in the rate received and the cost of transportation per ton-mile on the Lake Shore & Michigan Southern Ry. for periods of 40 years and 23 years respectively. This diagram so clearly explains itself that little comment is needed. It will be noticed that the rate per ton-mile has decreased 83.28% since 1854, or during 40 years. A little over 60.9% of this decrease has taken place since 1870. During this same time the cost of transportation per ton-mile has decreased 50.5%, a very significant comment on the even pace with which increased economy in operation has accompanied decreased rates. Although these figures are for only a single road, a very similar diagram might be prepared for any of the other trunk lines, and, in fact, for the railway system of the country as a whole, which would show a similar state of affairs.

In examining the diagram it must be remembered that the rates from 1861 to 1864 and thence to 1878 were measured in a depreciated currency. If the gold prices were substituted for those given, the decrease in rates would be practically continuous from the beginning.

We publish this diagram at this time not only because of its intrinsic interest, but because it was prepared by the late Cyrus P. Leland, auditor of the Lake Shore & Michigan Southern Ry., whose death occurred on June 20, and whose statistical work in the annual reports of that company and in various separate forms has been well known to railway men for the last 30 years. The period covered by the figures is almost coeval with Mr. Leland's life as a railway official, he having entered the railway service in 1855, at the age of 19 years, and retired from active work on account of ill health in May of the present year. The collection and compilation of statistics and reminiscences of the history of American railways were of particular inter-

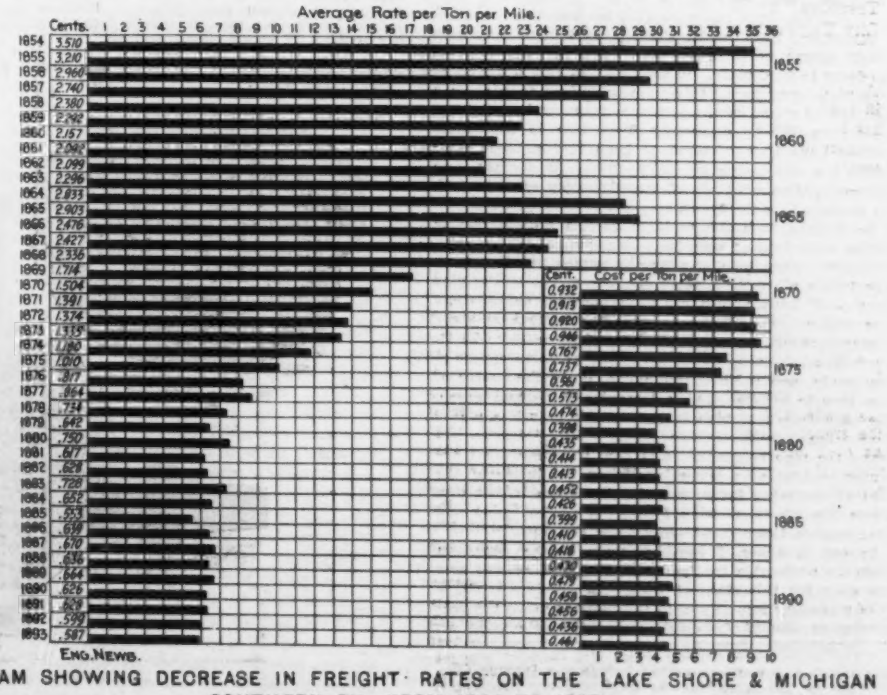
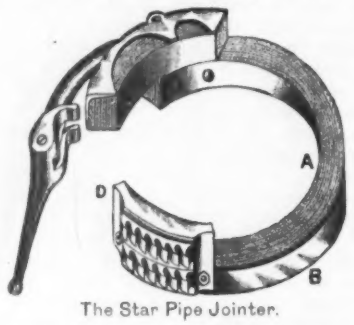


DIAGRAM SHOWING DECREASE IN FREIGHT RATES ON THE LAKE SHORE & MICHIGAN SOUTHERN RY., FROM 1854 TO 1895.

est to Mr. Leland, and he possessed a vast amount of matter relating to the subject. Much of this he has already published, and much more practically in shape for publication is stated to have been left at his death. Mr. Leland was president of the Association of American Railway Accounting Officers and was a prominent member of various other societies and associations of railroad men.

THE STAR PIPE JOINTER.

The disadvantages of the clay roll so commonly used in pouring lead joints in cast iron pipe are well known to those having such work in charge. The principal objection is the cost of labor, a good part, if not the whole of the time, of one man being required to make rolls. In addition, it is doubtless difficult to obtain suitable clay in some localities. A recent substitute for the clay roll is shown by the accompanying illustration. The part A is composed of Tuck's packing, which is reinforced by the pliable metallic band, B. The whole device is held in place for use by the lever at the right and the rack, D, which latter allows for variations in the thickness of the pipe.



The Star Pipe Jointer.

By trimming the packing with an ordinary knife a raised square or bevel molded joint may be secured, or the jointers can be supplied already cut for such joints if desired. Jointers from 2 to 48 ins. in size are kept in stock by the makers, the Star Pipe Jointer Co., Quincy, Mass.

TIGHT SEWER JOINTS.

The construction of sewers with tight joints is a problem of constantly increasing importance in this country and has been commented upon at length in previous numbers of this journal, especially in our issues of Aug. 25, 1892, and April 5, 1894. Since the last named issue we have received, as pertinent to the subject, some "Notes on Sewers in Wet Trenches," by Mr. W. C. Parmley, First Assistant City Engineer, of Peoria, Ill.*

We print these notes in full, as follows:

At Ogden, Utah, in the last 2½ years there have been about eleven miles of pipe sewers laid, ranging from 20 down to 6-in. pipes. In nearly all of this work water has been encountered to a greater or less degree. In a number of places resort to steam pumping became necessary, and very commonly from two to four hand pumps have been required to keep the trenches clear while the pipe-laying was in progress. Water has been encountered in all kinds of material from swamp muck to gravel and quicksands.

In dealing with the problem certain details require strict attention, or very leaky pipe work is the result. The first thing is to arrange the pumps so as to keep the trench clear for a short distance ahead of the pipe layers. If hand pumps are used they are set to draw the water from small sumps in the bottom at short distances apart. One pump is placed from 25 to 75 ft. in front of the pipe layers, according to the steepness of the grade, and a small channel is cut in the center of the trench bottom sloping toward the nearest pump. As each length of pipe is set, enough gravel is placed under the pipe to fill this small V-shaped trench and bring the pipe to grade. It is very important that the water be kept at a lower level than the inside of the bell of the pipe, for in case it enters the bell it prevents the workmen from forming a perfect joint and also washes the cement away from the pipe.

In wet trenches, I consider some of the American cements preferable to Portland. Portland cement sets too slow for this class of work. As absolute strength is of secondary importance to tightness of joint, the best cement is some of the quick-setting domestic varieties. Much of the cement we have used, when mixed with sand 1 to 1, will set in from 15 to 30 minutes. This has then acquired a certain degree of hardness before the water comes in contact with it.

In order to secure a good joint, the bell must be of large size, and of considerable depth that there may be plenty of room for calking and cementing. The movement recently inaugurated by Messrs. Blackmer & Post is in the right direction and one which I heartily commend. This consists of increasing the length of the pipe from 2 to 2½ ft. and the length of the bell from 2 to 2½ ins. The method of making the joint is to place a liberal amount of cement in the bottom of the open bell, set the spigot end of the next length into the bell and force it well in against the shoulder. The joint is then thoroughly calked with a rope of oakum and the cement pressed firmly in with the fingers, and well ridged up for about two inches in front of the bell. Special care must be taken to secure a good job on the under side of the pipe, as here is where most of the leaks originate. The pumps are all the while keeping the water away from the bottom of the pipe as it flows in from the sides of the trench.

Filling is immediately tamped well under the pipe and as far up as the top on the sides, and this to a large degree protects the cement from being washed away before set. In some very difficult places it is possible to secure a good joint only by covering the cement with a heavy layer of fine blue clay, as the water in spite of the pumps would force the cement before it would set. The clay very successfully resists the washing action of the water.

In a personal letter Mr. Parmley writes:

In addition to these comments, I will say that when I came East, supposing that numerous manufacturers made pipe with deep sockets, of large diameter, I specified that sockets should be on 8-in. pipe, and all larger sizes 2½ ins. in depth, and large enough to leave an annular space of 3-16 in. around the pipe. To my surprise the pipemakers have protested that only one firm could bid under that requirement.

The fact is that by actual measurement scarcely a pipe bell can be found that measures 2 ins. in depth, and most of them measure only about 1⅝ ins. With bells of these shallow depths, and with the small space allowed in some of the pipe submitted, it is impossible to obtain tight joints. I think engineers should insist upon manufacturers furnishing pipe having sockets of ample depth and size, as in this way, with proper care and skill, practically tight sewer joints can be made even when contending against considerable water.

* The notes were written while Mr. Parmley was in the West, and were presented before the Denver Convention of the American Society of Irrigation Engineers at the close of a paper entitled, "Continuously Riveted Steel Water Pipe."

SIZES OF STRINGERS FOR TEMPORARY RAILWAY TRESTLES.

In case of accidents or washouts it is of great importance to reopen the track as soon as possible, and very often temporary trestling is required in such cases. We are indebted to Mr. R. D. McCreary, Engineer of Maintenance of Way of the Western New York & Pennsylvania Ry., for the following table, issued to bridge men, carpenters, etc., to show the necessary width of stringers of different depths for various spans, the spans given being c. to c. of caps or wall plates. The table gives the width in inches of each stringer for fiber strains of 750 and 1,000 lbs. per sq. in. The former is for hemlock or pine structures of one or two spans and where the stringers extend only from cap to cap. The latter is for white oak stringers on single spans and pine or hemlock stringers extending over two spans and breaking joints. The end spans of trestles over two spans in length should be only three-fourths the length of intermediate spans, so as to equalize the stress. The stringers may be of one thickness or divided into two or more members, packed together. The table is calculated for heavy engines, having a weight of 113,800 lbs. on the driving wheels.

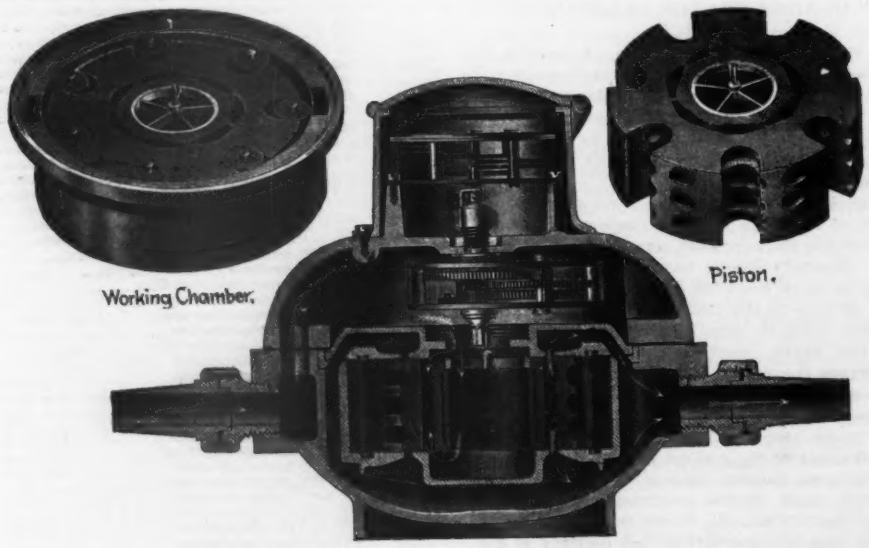
Safe Widths of Stringers for Temporary Railway Trestles.

Span c. to c. of caps., feet.	Load, Bend. mom., ft.-lbs.	Width for 12 ins. deep. 750 lbs. per sq. in. ins.	Width for 12 ins. deep. 1,000 lbs. per sq. in. ins.	Width for 14 ins. deep. 750 lbs. per sq. in. ins.	Width for 14 ins. deep. 1,000 lbs. per sq. in. ins.	Width for 15 ins. deep. 750 lbs. per sq. in. ins.	Width for 15 ins. deep. 1,000 lbs. per sq. in. ins.	Width for 16 ins. deep. 750 lbs. per sq. in. ins.	Width for 16 ins. deep. 1,000 lbs. per sq. in. ins.	Width for 18 ins. deep. 750 lbs. per sq. in. ins.	Width for 18 ins. deep. 1,000 lbs. per sq. in. ins.	Width for 20 ins. deep. 750 lbs. per sq. in. ins.	Width for 20 ins. deep. 1,000 lbs. per sq. in. ins.
4	18,730	12.5	9.4	9.2	6.9	7.9	6.0	7.0	5.3	5.6	..	..	..
5	22,910	15.3	11.5	11.2	8.4	9.8	7.3	8.6	6.4	6.8	5.1	5.5	..
6	27,090	18.1	13.5	13.3	9.9	11.6	8.7	10.2	7.6	8.1	6.0	6.5	..
7	31,270	20.8	15.6	15.3	11.5	13.3	10.0	11.7	8.8	9.3	6.9	7.5	5.6
8	35,450	23.6	17.7	17.4	13.0	15.1	11.3	13.3	9.9	10.5	7.9	8.5	6.4
9	42,460	28.3	21.2	20.8	15.7	18.1	13.6	15.9	11.9	12.6	9.4	10.2	7.6
10	50,920	33.9	25.5	24.9	18.7	21.7	16.3	19.1	14.3	15.1	11.3	12.2	9.2
11	59,470	39.6	29.7	29.1	21.8	25.4	19.0	22.3	16.7	17.6	13.2	14.3	10.7
12	70,680	47.1	35.3	34.6	26.0	30.1	22.6	26.5	19.9	20.9	15.7	17.0	12.7
13	82,590	55.1	41.3	40.4	30.3	35.2	26.4	31.0	23.2	24.5	18.4	19.8	14.9
14	94,640	63.1	47.3	46.3	34.8	40.4	30.3	35.7	26.6	28.0	21.0	22.7	17.0
15	106,850	..	..	52.3	39.3	45.6	34.2	40.1	30.1	31.7	23.7	25.6	19.2
16	119,210	..	..	58.4	43.8	50.9	38.1	44.7	33.5	35.6	26.5	28.6	21.5
17	131,730	..	..	..	..	..	..	49.4	37.0	39.0	29.3	31.6	23.7
18	146,050	..	..	..	..	..	..	54.8	41.1	43.3	32.5	35.0	26.3
19	162,050	..	..	..	..	..	..	..	..	..	..	38.9	29.2
20	178,250	..	..	..	..	..	..	..	..	..	..	42.8	32.1

THE WESTINGHOUSE WATER METER.

A new water meter, called the Westinghouse, has recently been put on the market by the Fuel Gas & Manufacturing Co., of Pittsburg, Pa. The general construction and working of this meter are shown by the accompanying cut, in which a cross section and views of both the working chamber and piston are presented. The piston and rollers are the only working parts of the meter, and its construction is such that the working chamber can be taken out without disconnecting from the service. The dial indicates gallons instead of cubic feet, a variation which will be found convenient by many waterworks officials.

The greatest proper quantity of water in gallons per minute for various sizes of meter, with the di-



DETAILS OF THE WESTINGHOUSE WATER METER.

mensions and weight of each size, are given by the company as follows:

Size, ins.	Proper Maximum, gallons.	Dimensions, ins.—Length.	Width.	Height.	Weight, lbs.
½ or ⅝	15	9⅞	8¼	8½	27
¾	30	11¼	9⅞	9¼	33
1	60	13½	11⅞	10⅞	54
1¼	90	14½	13	11½	82
2	150	16 3-16	14¼	12¾	115

RAILWAY OPERATIONS IN THE UNITED STATES; YEAR ENDING JUNE 30, 1893.

The summary of the sixth annual report of the Statistician of the Interstate Commerce Commission, which has just been sent out to the press, shows a total mileage of railways in the United States on June 30, 1893, of 176,461 miles. This is an increase during the year ending at that date of 4,897 miles, or 2.8%. The State of Washington leads in construction with 556 miles; Montana shows an increase of 409 miles, Minnesota of 406 miles, and West Virginia of 365 miles. The other states which show an increase in mileage in excess of 100 miles are California, Florida, Indiana, Michigan, Missouri, New York, Ohio, Pennsylvania, Texas, Wisconsin and Wyoming. The States of Kansas, Oregon, the Territory of New Mexico and the District of Columbia show a slight decrease in mileage, due to remeasurement of main lines or abandonment of small, unimportant lines. The number of roads abandoned during the year was 19. The total mileage of railway track was 230,137, which includes 10,051 miles of second track, and 42,043 miles of yard track and sidings.

The total number of railway corporations in existence June 30, 1893, was 1,890, being an increase of 68 during the year covered by the report. The tendency toward some form of consolidation during the year has been quite marked; 28 roads, representing 749 miles, have been merged; 20 roads, representing 1,732 miles, have been reorganized, and 16 roads, representing 1,469 miles, have been consolidated. These items are higher than the corresponding items of the previous year.

The number of tons of freight carried per freight locomotive was 40,062, and the number of ton miles accomplished per freight locomotive was 5,031,889. These figures show no change in the efficiency of freight locomotives as compared with previous years. The number of passenger cars per 1,000,000 passengers carried was 53, and the number of freight cars per 1,000,000 tons of freight carried was 1,613. The increase in equipment fitted with train brakes, or automatic couplers, as compared with the increase in equipment itself, is not as marked as in the previous year. Thus from a total increase in equipment during the year ending June 30, 1893, of 60,506, the increase in equipment fitted with train brake was 42,158, and the increase in equipment fitted with automatic coupler was 77,904.

The total number of employees in the service of railways on June 30, 1893, was 873,602, being an increase of 52,187. The number of employees per 100 miles of line was 515.

The total capitalization of all railways is given as $10,506,235,410, or $63,421 per mile of line, of which $4,668,935,418 was capital stock. Of the total stock 61.24% paid no dividends, and of the total bonded indebtedness 10.93% of the mortgage bonds and 82.56% of the income bonds paid no interest. Of stocks paying dividends, 5.25% of the aggregate stock paid from 4 to 5%, 11.62% paid from 5 to 6%, 5.24% paid from 6 to 7%, and 5.32% paid from 7 to 8%.

A slight increase is shown in the freight train load, it being 183.97 tons, as compared with 181.79 tons for the previous year. The average haul per ton was 125.6 miles, and the average journey per passenger was 23.97 miles. The total earnings from operations were $1,220,751,874, of which 29.49% was passenger earnings, and 68.23% freight earnings.

The figures show an increase in both the number of employees killed and injured during the year, as follows:

	1893.	1892.	Inc. or dec., '93 over '92.
Employees killed	2,727	2,554	+173
" injured	31,729	28,267	+3,462
Passengers killed	299	376	−77
" injured	3,290	3,227	+2

Arranged according to the nature of the accident, the number of employees killed was as follows, compared with 1892:

	1893.	1892.	
Coupling and uncoupling cars	433	378	+55
Falling from trains and engines	644	611	+33
Overhead obstructions	73	80	−7
Collisions	247	286	−39
Derailments	153	145	+8

As will be seen, the greatest increase in accidents to employees was in the coupling and uncoupling of cars.

IRRIGATION AND COTTON IN PERU.

By J. C. Blume y Corbacho.

The Spaniards found the coast lands of Peru in a half state of cultivation, made possible by irrigation, but under the tyranny of Spanish rule the irrigated lands of the Incas became a barren waste, and, to a large extent, still remain so. Recently the possibilities of agriculture have been impressed upon the people, who, like those of California, are now realizing that the real strength of the country lies in the products of the tilled soil.

In this connection one of the northern valleys, the Piura, now claims attention, because of the production of an extraordinary class of cotton. This article has not been thought of value for exportation until within the last three years, during which time it has become of great demand in England, far exceeding the supply, and is now attracting the attention of manufacturers of fine underwear and hosiery in the United States. Hitherto it had been used solely for the coarse ponchos of the poens and their striped saddle bags.

The lands of the Piura lie four or five degrees south of the equator, and once in seven years are visited by floods that wet a narrow belt along the banks, whereby some 1,600 acres are made available for cultivation, all of which is now appropriated to cotton. This one wetting gives five crops, two per year, and then the ground rests to finish the cycle of seven years and another succession of five crops.

The cotton produced in the valley of the Piura shows varying shades, from a rich dark brown to the purest white, so finely graded that one can scarcely discover where one color ends and another begins. At the present time the cultivated area is so small that the demands of the market cannot be met. To increase this area an irrigation system has been devised by the American engineer, Maj. Alfred F. Sears, M. Am. Soc. C. E., whose surveys and observations, extending over a period of two years, show that a yearly treasure of 70,000,000,000 cu. ft. of water are lost in the sea for want of an irrigation system to divert it from the river bed to the adjacent pampas.

In 1892 the Peruvian Government granted a concession to Major Sears, and he has been steadily at work during this time perfecting plans for the construction of an extensive irrigation system, the concession having been meanwhile transferred to the North Peru Co., 15 Cortlandt St., New York, a corporation with abundant capital, which has contracted with the American Railway Equipment Co. for the construction of their works. The first section will cover about 20,000 acres, while the area of pampa to be improved by using all the water of the river is something more than a million acres. But the concession grants the right to take water from the neighboring river Chira, which will supply two or three times the capacity of the Piura. Colonization enters largely into the scheme, although there are more than 40,000 of an industrious population, now abiding in the Piura valley, who live by fishing and manufacturing industries in the off years which do not permit the cultivation of the soil.

This valley is not only adapted to the cultivation of cotton, which, by the way, fluctuates in value with wool, since it is exclusively used in the adulteration of woolen goods, to which it adds lustre, strength and protection against shrinking, but will also raise coffee, cocoa, tobacco, sugar, indigo, and all the fruits of the tropics, with the vegetables required on the tables of the country. The colored varieties of the cotton permit the fabrication of certain very stylish "merino" goods of real sanitary properties, since they are free from aniline dyes, and the colors, being natural, never fade.

Recently the Peruvian Government sent one of its ablest engineers to make a study of the irrigation of the right-hand bank of the Chira River, a large river of constant flow in the Department of Piura. This study was ordered in the hope of increasing the area capable of producing this cotton, so valuable on account of its lustre and long staple.

The report of Mr. M. A. Vinyas, the engineer commissioned for the study, states that the area of irrigable land on the right-hand bank of the Chira is 70,000 acres, which can be irrigated by the construction of a canal, costing about $720,000, or $13 per acre.

The 70,000 acres would pay, if rented to planters at the customary rates, from $250,000 to $300,000 per year, or, say, 35% on the capital in the first year and much more in the succeeding years. With an additional initial expenditure of $40 per acre to put the land under cultivation for cotton, each acre would return $80 per year, as it does now in the watered portions of the pampa. Therefore, from an outlay of $720,000 for an irrigation system and $2,730,000 of capital for cultivation, or a total of $3,450,000, there would be derived a revenue of $5,600,000, or 160% the first year, while in subsequent years, with a lessened expense for cultivation, the return would be larger.

Peru wishes to attract either English or American capital, and it is to be hoped that Americans may show a little more interest in South American enterprises, and not leave everything of this sort to England. It may be noted in this case that manufacturers in the country have to import Peruv an cotton from Liverpool, where a few houses have obtained its monopoly by advancing money to the planters at a very high rate of interest.

SEWAGE IRRIGATION.*

By S. H. Orme, M. D.

It is unnecessary to adduce to citizens of California the immense advantage of irrigation to most crops. Water, pure and simple, is such a benefit that few stop to realize that a vast amount of fertilizing matter, partly dissolved and partly held in suspension, is suffered to run to waste from all our cities and towns.

The excreta of human beings are far richer in nitrogenous constituents than those of domestic animals, from the nature of our food, and consequently they have a greater value for fertilizing.

The trouble in dealing with human excreta is the rapid decomposition, by which the value is destroyed It is generally necessary to apply it to the soil within two or three days, and the only practicable way is by water-carriage. If kept moving the time may be prolonged, so that it may flow for a distance of 30 or 40 miles if necessary. Another point is that the volume of carrying water be not excessive, say, not more than 50 or 60 gallons daily per capita, or the area of land within reach of a city and available irrigation would become inadequate.

The utilization of sewage irrigation is not entirely new in Los Angeles, but until recently has not been thought entirely practicable during the winter months. (See Eng. News, Feb. 23, 1893.—Ed.) The past season, however, has been unusually dry (the rainfall having been only 8 ins.), and it has been found that the whole sewage of the city can now be disposed of in this way. Still better, the authorities are now able to charge $5 per head (100 ins.) for the sewage for irrigation purposes during the day, and $3 for the night. It is estimated that the daily amount of sewage is 14 heads, or 1,400 ins., on the line of the outfall sewer. I might here add that this great outfall sewer to the ocean is now finished, but the internls and house-connections with the sewerage system are not yet completed. When the latter work shall have been done, Los Angeles will have a public work of which she may justly be proud.

It is alleged that sewage-farming is practicable only for towns of moderate population, owing to the high price of lands contiguous to large cities. The answer is that Paris has adopted this plan, which already disposes of one-third of its sewage; Berlin uses it exclusively; Florence, Milan and Madrid, have sewage farms; Edinburgh has practiced the method for 200 years; Birmingham thus utilizes the sewage of its 650,000 inhabitants. Including small towns, this system has been adopted by 200 centers of population in England.

In judging this question upon its merits, we must look beyond financial results. It is chiefly a sanitary matter.

The real difficulty in sewage irrigation, as in other public works, is in administration. If any way could be devised for managing public business by the same methods of economy that are employed in private affairs the trouble would vanish. The indispensable condition of sanitary and financial success is to divorce

* Abstract of a paper read before the California State Sanitary Convention, April 16, 1894.

WEATHER TABLE FOR MAY, 1894. (Furnished to Engineering News by the Department of Agriculture.)

	Stations.	Temperature. (Deg. Fahr.)				Wind.			Precipitation—rain or melted snow—inches.		
						Velocity in miles per hour.		Direction at time of max. velocity.			
		Average.	Max.	Min.	Range.	Average.	Max.		Total.	Heaviest in 24 hours.	No. of rainy days.
Northern Cities.	Northfield, Vt.	54.4	83	30	53	9.6	51	SW	3.33	1.30	16
	Portland, Me.	52.1	84	38	46	8.3	25	NW	7.33	2.82	16
	New York, N. Y.	60.8	83	44	39	10.0	36	SE	3.90	0.75	13
	Pittsburg, Pa.	61.6	87	40	47	6.0	27	SW	4.63	0.91	19
	Chicago, Ill.	56.1	88	35	53	18.0	62	E	3.35	1.02	13
	Omaha, Neb.	64.6	91	38	53	9.7	30	W	0.61	0.33	7
	St. Paul, Minn.	58.9	86	38	48	9.0	35	NW	6.63	2.98	11
	Duluth, Minn.	48.2	80	36	44	7.9	38	NW	5.62	1.33	15
	Bismarck, N. Dak.	55.4	85	34	51	14.0	54	NE	0.77	0.61	5
	Average.	56.9	85	37	48	10.3	40		4.02	1.34	13
Southern Cities.	Washington, D. C.	65.9	88	41	47	6.5	47	NW	4.03	1.32	15
	Louisville, Ky.	64.6	90	38	52	7.7	38	SW	3.90	0.74	18
	St. Louis, Mo.	66.0	92	40	52	10.7	42	SW	3.61	1.29	11
	Savannah, Ga.	73.2	93	44	49	8.0	44	NW	5.93	1.29	11
	Kansas City, Mo.	64.9	90	39	51	9.2	34	NW	2.08	0.76	7
	Jacksonville, Fla.	75.3	95	46	49	7.8	34	SW	1.49	0.34	9
	Chattanooga, Tenn.	67.7	89	40	49	6.7	34	S	1.53	0.86	14
	New Orleans, La.	75.3	90	55	35	6.7	32	N	1.79	0.58	5
	Memphis, Tenn.	69.0	90	44	46	7.0	36	NW	5.70	1.65	13
	Palestine, Tex.	74.4	92	50	42	6.0	20	SE	1.83	1.22	7
	Average.	69.6	91	44	47	7.6	36		3.19	0.96	11
Western Cities.	Helena, Mont.	54.8	81	31	50	8.9	34	SW	1.66	0.64	12
	Port Angeles, Wash.	49.8	81	32	49	6.0	27	W	1.96	0.74	11
	San Francisco, Cal.	55.4	72	44	28	12.7	36	SW	1.31	0.68	6
	Salt Lake City, Utah	61.2	85	33	52	7.2	30	W	1.22	0.90	5
	Santa Fe, N. Mex.	58.8	80	37	43	8.3	38	SW	1.99	0.75	5
	Denver, Colo.	59.0	85	35	50	8.9	48	W	3.00	1.15	9
	Yuma, Ariz.	77.1	102	50	52	7.9	34	NW	Trace.	Trace.	0
	Average.	59.4	84	37	46	8.6	35		1.59	0.69	7

the administration of the system from party politics. Experience in foreign countries has demonstrated that the value and productiveness of lands thus irrigated are immensely increased, without the use of other fertilizers; and here, where farmers and gardeners are glad to pay a fair and remunerative price for plain water, there can be no economic difficulty in organizing a company and using sewage free of cost for its own lands. The only apprehension would be that the company would ask and obtain undue advantages in its franchise in the shape of a public bonus or other favorable terms to the detriment of private interests.

SPECIFICATIONS FOR A BOROUGH SURVEY.

We reprint herewith a set of specifications for the survey of a borough in Pennsylvania, which were recently furnished us by a correspondent, and which will doubtless be examined with a good deal of interest. Specifications for Government land surveys have been long in use, of course, but it is something rather new to draw up specifications for borough and city surveys, and set engineers to bidding against one another for the work. As to the wisdom of giving out engineering work in this way, opinions will doubtless differ; but certainly there will be general agreement that professional work of this sort ought not to be given to the lowest bidder, and on the other hand that even an incomplete written contract is fairer and better for both parties than a purely verbal agreement.

In reprinting the specifications we have amended some obvious errors of form; otherwise it is given verbatim.

Specifications for the Survey of the Borough of Swarthmore.

1. The measurements are to be made with the Chesterman steel tape and U. S. standard maluta ned throughout the work by noting temperature, tension, etc., suitable allowance to be made for expansion and contraction. Principal measures for the most part to be made during cloudy days, so that no sudden flashes of sunshine shall impair uniformity.

2. The plan of survey must be made with the view of observing private as well as public rights. Where necessary to obtain old lines, copies of the descriptions of deeds must be obtained, and these, when required, roughly plotted to show how much ground is called for in the several blocks. All streets in the several subdivisions of * * * must be accurately shown, block distances, courses, etc., given. With these data before him the engineer shall make a working plan of the borough as he finds it.

3. In order to do this the engineer must proceed as follows: Establish two base lines running about north and south, namely, one on C. & S. Road, the other on L. Road, and two running about east and west, one on Y. Ave. and the other on E. Ave. Whenever necessary the positions or location of permanent buildings must be noted. When angles occur in the streets, ascertain the angle of deflection by the measured divergence with the distance from angle point, and so proceed with streets until the whole plot is completed. All the work must be so performed as to fit together accurately, so that all calculated lines will bear the test of measurement.

4. As the data accumulate the engineer shall proceed with the working plan, upon which he shall plot all required measurements, and note page of field book, so that he can at any time refer to original notes for verification. A correct copy of all calculations must be kept for future reference, after application of the work.

5. Wherever new streets may be required, a careful topographical survey must be made in order to properly locate same with respect to grading, drainage, etc.

6. The engineer must furnish and plant a suitable number of monuments or street stones in order to properly locate and define all street lines, angles, etc. Said stones must be at least 3 × 4 ins. and 24 ins. long with ¼ in. hole, ½ in. deep, drilled in the top to mark the precise point of line or angle. As far as possible said stones are to be planted at northwest corner of streets on what is known as the 5-ft. range from the property lines, and at all borough corners they must be planted in perpendicular position. They must not be over 1,200 ft. apart and must be placed at all angles or changes of direction of streets. All street stones must be accurately marked on the plan, showing location of property line in relation to them.

7. Grade regulations shall be made from careful and accurate levels taken over the entire borough, establishing bench marks on door sills, streets stones and other permanent objects. Said bench marks must be carefully tested to insure their accuracy. All street stones must have their elevations accurately taken and marked on the borough plan. All elevations are to be referred to Sandy Hook datum. Curb heights and grades must be fixed with regard to both public and private interests. On paved avenues, elevations must be taken at such distances apart as will show the accurate grade with all changes of grades, summits, low points, etc., and these must be adhered to as closely as possible. On unpaved streets, elevations must be taken every 100 ft., and the nature of the ground on either side must be noted, so that such grades may be established as will do the least possible injury to properties abutting on said streets and at the same time insure good surface drainage.

8. Duplicate plans must be made, which must show all streets, public roads and alleys, both property lines and curb lines, block distances, widths of streets between curbs and sidewalks, all angles marked, true courses of streets given, curb grades marked at all street corners. Wherever a change of grade is made the elevation must be given and the distance from the nearest street corner shown. In general, everything necessary and requisite to make a complete plan of the borough must be shown. The borough contains about 700 acres and has about 15 miles of streets.

RAILWAY OPERATION DURING THE REVOLUTION IN BRAZIL.

The difficulties encountered by a railway company in operating its line in a country subject to political revolutions are shown by the following extract from the statement of the president of the Southern Brazilian Rio Grande Do Sul Ry. Co., at the annual meeting of the company in London on May 15.

During the second half of 1893, our line was interrupted for about 130 days, the upper part of the line being practically out of traffic all the time. On July 1, the girders of the Candiota Bridge (Candiota being 138 miles from Rio Grande do Sul, that is, about 36 miles from Bage) were thrown into the river. Attempts were made by our staff to replace the girders by some which had been obtained from the government stores, which were originally intended for the line from Bage to Casequi. Despite all the efforts of our staff, they were unsuccessful in launching the girders, and at the end of 1893 the bridge was still down, so that the traffic from Candiota could only be carried on by the transhipment of goods, which was started on Aug. 13, and carried on during the few intervals that the whole of the line was in our possession, up to the end of the year. Other bridges were damaged. Three particularly had their girders destroyed, and the masonry pulled about, and they were altogether put into such a condition that traffic could not possibly be carried on over them. They were propped up with sleepers so as to enable trains to pass over them at a very slow rate. The moment the insurgents got hold of the district again where we had established this communication, they burned the piles of sleepers, and the bridges became useless, as before. Moreover, the burning of the sleepers buckled the girders, and it is doubtful to what extent they can be repaired. Rails were torn up; two of our engines were disabled by violence, and three were made useless by the safety-valves being taken away. Some of out freight cars were burned, others were damaged. The telegraph wires were cut over and over again; the telegraph instruments were taken away, and now and then even our men who were working on the spot were impressed into the service of the insurgents, and had to go away with them. The situation was certainly a very trying one. On the one hand, the government by its representatives intimated that they needed our assistance to the fullest extent. The line, of course, was a valuable adjunct to military operations, for the purposes of carrying troops, horses, ammunition and supplies of food even to a distressed people, and we were constantly required by the government to put our line and rolling stock at its disposal. In the proportion that our line was useful to government operations it was disastrous to the insurgents, and naturally when there was a withdrawal of troops or any similar change in the game of war, our line was exposed to the action of the revolutionists, who would come in and destroy what we had made good. They openly told us that as we served the government, who were their enemies for the time being, they would do the best they could to prevent our serving them again by means of our line. Our men, particularly on the upper portion of the line, were harassed first by one side and then by another, and not least, perhaps, by the hangers-on of the various military groups which surged to and fro.

LEGAL DECISIONS OF INTEREST TO ENGINEERS.

Validity of Ordinance for Removal of Growing Trees.

An ordinance passed without notice to the prosecutor, directing a committee to remove certain objects upon lands which had been occupied by the prosecutor for 25 years, because they were encroachments upon a street, is void. The power to prevent and remove all encroachments in or upon any street is only a police power, and does not extend to cases of a doubtful or uncertain nature, and which require to be first lawfully determined. The power to declare what is to be considered nuisances in streets, and to remove encroachments and nuisances from highways, is a police power, ministerial in its nature, and designed to relieve the public from such obstructions in streets as are apparent or readily ascertainable, without the necessity of adjudication. The power is capable of exercise only to the extent that the right is clear or reasonably known, and not so as to invade rights which, from their doubtful or uncertain nature, require a lawful determination. To say to a man that he shall not use his property as he pleases under certain circumstances is to deprive him of the enjoyment of such property. To find conclusively against him that a state of facts exists with respect to the use of his property, or the pursuit of his business, which subjects him to the condemnation of the law, is to affect his rights in a vital point. The right to abate nuisances, whether regarded as existing in the municipalities or in the community, or in the land of the individual, is a common law right, and is derived in every instance of its exercise from the same source, that of necessity; but the necessity must be present to justify the exercise of the right, and, whether present or not, must in ordinary cases, be submitted to a jury under the guidance of a court. The finding of a municipal body can have no effect whatever for any purpose upon the ultimate disposition of a matter of this kind. It is for the courts. A thrifty tree in a public highway, the fee of the soil of which is in the abutting landowner, belongs to the abutting landowner (unless it has been planted by the public authorities), and he may have trespass against any person who cuts down any such trees growing on the side of the road, and left there for shade or ornament; for the freehold remains, subject only to the easement or right of passage in the public. Nothing is more common everywhere in our villages and rural districts than for the owners and occupiers of the soil to have fruit, shade, and ornamental trees along the line of the public roads, sometimes in the line of the roads, sometimes on each side of the line; and it has been held that a road overseer cannot arbitrarily cut them down, and, if he did it in an improper case and maliciously, he was held liable to exemplary damages upon suit of the owner of the fee of the soil. These standing trees are part of the inheritance, and a sale of them would be a sale of an interest in land under the statute of frauds. If these trees were nuisances, trespass would not lie for their destruction by municipal authority. It is clear that thrifty, ornamental shade trees are neither obstructions nor nuisances, and the attempt to abate them as such is an exercise of arbitrary power, unwarranted in law, under the act invoked by the authorities.—State v. Mayor, etc., of Vineland (Supr. Ct. of N. J.), 28 Atl. Rep., 1038.

Boundaries Located by Government Survey Must Control.

Field notes and plats of the original government survey are competent evidence in ascertaining where monuments are located, in case a government corner is destroyed, or the point where it was originally placed cannot be found, or the location of the original corner is in dispute; but, when it is shown by uncontradicted evidence that a section corner was located by the government surveyors at a certain point, such location must control, even though it is at a place different from that given in the field notes and plat. Woods v. West (Supr. Ct. of Neb.), 58 N. W. Rep., 938.

CONSTRUCTION NEWS.

RAILWAYS.

East of Chicago—Projects and Surveys.

MARION & ST. CLAIR.—Incorporated in Pennsylvania to build a railway from Marion Slope in Blythe township to a connection with the Philadelphia & Reading at or near St. Clair, all in Schuylkill county, Pa.; capital stock, $50,000; Pres., Wm. H. Taylor, Scranton.

Southern—Existing Roads.

CHARLESTON, CLENDENNIN & SUTTON.—Philadelphia and Pittsburg capitalists have secured a controlling interest in this road and it is expected that the extension of the line will soon be commenced. Pres., C. C. Lewis, Charleston, W. Va.; Secy., W. S. Drake, Philadelphia.

DRY FORK.—John W. Moore, Jr., Ch. Engr., Hendricks, W. Va., writes us that 23 miles of track have been laid on this road and that it is expected to have the remaining 12 miles completed by Sept. 1. The work is now being rapidly pushed. The line extends from Hendricks, W. Va., on the West Virginia Central & Pittsburg, to Gaudy Creek, 30 miles, and up Gaudy Creek 5 miles. The work is moderately heavy; curves and grades light.

ROARING CREEK & CHARLESTON.—About 100 men are at work on this road, which is being built from Harding, W.Va., on the West Virginia Central & Pittsburg, up Roaring Creek, about 15 miles, and we are informed that about 4 miles of track has been laid and 5 miles of the line graded. The work is light; curves and grades heavy. The principal source of traffic will be coal and lumber. Gen. Man., Geo. Potts, 45 Broadway, New York.

Northwest—Existing Roads.

KICKAPOO VALLEY & NORTHERN.—At the meeting at Madison, Wis., June 22, plans were considered for extending this railway, according to reports. Supt., W. H. Thompson, Prairie du Chien, Wis.

Projects and Surveys.

DENVER, SIOUX CITY, LAKE SUPERIOR & CHICAGO.—Incorporated in Colorado to build a railway from Denver to Minneapolis, St. Paul, Duluth, Winnipeg and Chicago; capital stock, $3,000,000; directors, John Evans, H. M. Porter, J. D. Brown, J. T. Corngorth, W. A. H. Loveland, R. W. Woodbury, George Fritch, J. W. Neswith, William Barty, T. A. Cooper, W. N. Byers, F. A. Keener and W. G. Evans. This is the line noted some months ago as projected by ex-Gov. Evans and the chamber of commerce of Denver, and the project calls for the construction of 110 miles of new road between Julesburg, Colo., and O'Neill, Neb.

Southwest—Existing Roads.

PECOS VALLEY.—About 30 miles of the grade has been completed on the extension from Eddy north to Roswell, N. Mex., 90 miles, and nearly two miles of track laid. The line is expected to be completed and in operation this fall.

Projects and Surveys.

BRAZOS & BURLESON.—Surveys for this proposed railway in Texas are being made by Prof. J. C. Nagle, of the Texas Agricultural & Mechanical College. The route is from Clay Station, on the Gulf, Colorado & Santa Fe, to the terminus of the Hearne & Brazos Valley at Stone City. Prof. Nagle writes us that the incorporators are all Brazos Bottum farmers. The road will be only 17 or 18 miles in length, but will move about 10,000 bales of cotton annually.

OKLAHOMA CENTRAL.—Incorporated in Oklahoma to build a railway from Arkansas City, Kan., to Eagle Pass., Tex., with a branch from Hunnewell to Parker, Okla.; capital stock, $4,000,000; incorporators, Hiram Stout, C. M. Bay, T. M. Hewing, Chas. Betts, J. O. Harrison, J. Y. O'Neal and W. N. Branton. Work of construction will begin on the Hunnewell branch this week, according to a press report from Guthrie, Okla.

Rocky Mt. & Pacific—Projects and Surveys.

UTAH.—Salt Lake City papers devoted considerable space last week to railway and mining projects of Capt. J. R. De Lamar, of Idaho. Capt. De Lamar is interested in large mining property near Pioche, Nev., and is organizing a company to build a railway from Milford, Utah, to Pioche, Nev., connecting with the Nevada Southern to the Pacific Coast. The company is said to possess 30 miles of narrow gage railway near Bullionville, Nev., and nearly 100 miles of grading done several years ago by the Union Pacific. H. B. Claflin and other New York capitalists are reported as interested.

Foreign.

CENTRAL DOMINICAN.—The Company of the Central Dominican Ry. was incorporated at Jersey City, N. J., June 27, to acquire from the San Domingo Improvement Co., New York, a certain concession or contract for the operation of a railway in the Republic of San Domingo; capital stock, $1,500,000; Willard Brown, Chas. W. Wells, New York; E. D. York, Flushing, N. Y.; E. A. MacClean, West Summit, N. J., and others.

STREET AND ELECTRIC RAILWAYS.

BROCKTON, MASS.—The West Side St. Ry. Co. has been organized to build an electric railway; capital stock, $50,000; directors, J. C. Snow, J. E. Carr, P. K. Bacon and others.

CONWAY, MASS.—A company is being formed to build an electric railway from Conway Junction to Burkeville, a distance of five miles; estimated cost, $35,000 to $47,000.

HARTFORD, CONN.—The Hartford St. Ry. Co. has awarded the contract for boilers for the new power house to the Heine Water-Tube Boiler Co., St. Louis, Mo., and the contract for the engines to Ball & Wood Engine Co., Elisabeth, N. J.

PHILADELPHIA, PA.—The Aramingo Ave. Passenger Ry. Co., capital stock $12,000, and the East Aramingo Ave. Passenger Ry. Co., capital stock $18,000, have been incorporated. Pres., H. C. Moore.

POTTSVILLE, PA.—The Schuylkill Electric Ry. has been bought by New York and Philadelphia capitalists, who propose to extend the road to St. Clair and Minersville. The capital stock of the new company is about $2,000,000.

WAUKEGAN, ILL.—The Bluff City Electric St. Ry. Co. has been incorporated with a capital stock of $200,000, by D. L. Jones, S. D. Talcott and Chas. Whitney.

GREEN BAY, WIS.—It is reported that an electric railway project is being discussed.

ATLANTIC, IA.—It is stated that plans are about completed for a street railway.

FORT DODGE, IA.—The council has granted a 25-year franchise to S. T. Meservey for an electric railway.

DULUTH, MINN.—The Duluth-Superior Traction Co. has been incorporated at Elizabeth, N. J., to acquire, build, equip and operate street or elevated railways, bridges, viaducts, etc.; capital stock, $2,000,000; John H. Davis, New York; Frank Bergen, Elizabeth, N. J.; Edward V. Douglas, Philadelphia.

GUTHRIE, OKLA.—It is reported that Charles Fitzgerald has been granted a franchise for a street railway.

BELLEVILLE, ONT.—S. A. Lazier & Sons and Henry Pringle have received a franchise for an electric railway in this city, the line to be completed by August, 1895.

HIGHWAYS.

MASSACHUSETTS.—The state highway commissioners have appropriated $20,000 for improving roads in Bristol county, and it is reported probable that the county commissioners will use the appropriation for improving the road between Fall River and New Bedford.

NEW JERSEY.—Bids are asked by the committee on streets and roads of Mercer county, Trenton, until July 16 for macadamizing a road in Ewing township.

NEW JERSEY.—Bids are asked until July 9 for paving the Pompton turnpike in Essex county will telford macadam. Jas. Owen, County Engr., U. S. Credit System Bldg., Newark.

OHIO.—Bids are asked by the commissioners of Lucas county, Toledo, until July 30 for constructing a stone road.

ILLINOIS.—Bids are asked until July 10 for building a road 5 ft. high, 36 ft. wide at base and 20 ft. wide at top from Beardstown to Frederick, 3½ miles. T. K. Condit, Chn.; R. H. Garm, Secy.

BRIDGES AND TUNNELS.

BUFFALO, N. Y.—Bids are asked until July 12 for a plate girder bridge over Scajaquada Creek. R. G. Parsons, Acting Secy. Dept. Pub. Wks.

WEST CHESTER, PA.—Bids will soon be asked, according to reports, for building the new county bridge over Chester Creek, in East Goshen township, and for an iron bridge of 60-ft. span over Beaver Creek, East Brandywine, and a 46-ft. clear span bridge over White Clay Creek, New Garden.

WILLIAMSPORT, MD.—The Potomac Bridge Co. has been organized to build an iron bridge across the Potomac River at this place; capital stock, $35,000; Pres., J. H. Hoffman; Treas., J. L. Motter; Secy., M. E. Cullen.

CAMBRIDGE, O.—Bids are asked by the commissioners of Guernsey county until July 12 for a 160-ft. iron highway bridge over Wells Creek.

CINCINNATI, O.—The board of administration has approved plans for a proposed viaduct 607 ft. long on West Eighth St., from Elberon Ave. to Lincoln Ave.; estimated cost, $59,699. It is expected that the work will soon be advertised.

SIOUX CITY, IA.—A press report of June 26 states as follows: The special election to ascertain whether a tax amounting to $340,000 would be voted to aid in the construction of a combination railway and wagon bridge across the Missouri River here, was carried to-day in favor of the tax by a vote of over three to one. Work on the bridge commences to-morrow. It will be five spans long, with two draws, and will cost $200,000. The building of this bridge will bring several new railways to this city.

ANOKA, MINN.—The contract for rebuilding the bridge at St. Francis has been awarded to Gillette & Herzog, Minneapolis, at $5,972.

DILLON, MONT.—Bids are asked until Sept. 3 for constructing a bridge over the Red Rock River at or near Shineberger's place, at Red Rock. T. J. Murray, County Clk.

MILES CITY, MONT.—The county commissioners have directed the clerk to ask for bids for building an iron or steel bridge across the Powder River about 45 miles from this city.

WATER-WORKS.

LOWELL, MASS.—The water board has decided to purchase the plant of the Cook Well Co., which has been trying to secure a daily supply of 5,000,000 gallons from tube wells. Only 3,300,000 gallons is reported as obtained, and the city will now conduct its own experiments.

METEUEN, MASS.—J. T. Howe, Town Clk., writes us that works are being constructed, including covered reservoir; supply from 42 driven wells; estimated cost, $150,000; Engr., Frank L. Fuller, Boston.

SPENCER, MASS.—A. W. Curtis, Town Clk., writes us that the commissioners have been requested to investigate as to a filter plant.

NORFOLK, CONN.—The contract for constructing works has been awarded to J. M. Riley, New York, at about $55,000, according to press reports.

AMITYVILLE, N. Y.—The citizens have voted to contract with the Amityville Water Co. for 45 hydrants for five years at $1,000 per year.

BROOKLYN, N. Y.—The aldermen have appropriated $10,000 for investigating the question of an additional supply.

CHERRY CREEK, N. Y.—G. E. Martin, Clk., writes us that nothing will probably be done for works for a year.

COXSACKIE, N. Y.—Bids are asked until July 20 for constructing works, as stated in our advertising columns. Engrs., Voorhees & Witmer, Buffalo, Wm. K. Reed, Village Clk.

DAVENPORT, N. Y.—H. S. Wickham, Pres. Davenport Water Co., writes us that Frank Roundy, Davenport, is preparing plans for works, but that the specifications are not yet ready.

KINGS PARK, N. Y.—A successful test well has been sunk at the county farm, and other wells will now be sunk in the vicinity and pipes laid to use this supply.

NEW YORK, N. Y.—Bids are asked until July 10 for a tank and stand-pipe at the new aqueduct between 10th Ave. and Harlem River. Michael T. Daly, Comr. Pub. Wks.

PINE HILL, N. Y.—The Highmount Water Co. has been incorporated by J. A. Longyear, E. B. Walker, Kingston; Geo. H. Lasker, Griffin's Corners, and others; capital stock, $10,000.

MONROE, N. Y.—The question of incorporation will be voted upon July 31. There is talk of securing works.

RHINEBECK, N. Y.—J. R. Thompson, Ameuia, has asked for a franchise for works. A supply would be secured from a pond. Plans include a reservoir and filter plant, according to reports.

DECKERTOWN, N. J.—The J. M. Riley Water-Works Co., New York, and the Deckertown Water-Works Co., Deckertown, are reported to have submitted bids for putting in works, question to be considered by the committee July 5. Chas. H. Smith, Engr., is interested in the latter company.

WILDWOOD, N. J.—An artesian well is being sunk and it is stated that works will be put in this fall.

HALIFAX, PA.—J. J. Rouch, Secy., writes us that the council is considering the advisability of securing estimates for works; supply from mountain spring; population, 700.

HARDING, PA.—The Falling Spring Water Co. has been incorporated to supply water to Marcy township, Luzerne county; capital stock, $6,000; Treas., Pierce Butler, Wilkes Barre; directors, Thos. English, Pittston; E. B. Long, J. A. Morris, West Pittston.

HATBORO, PA.— Efforts are being made to organize a company with a capital stock of $10,000 to put in works. Address E. E. Shelley.

LEBANON, PA.—Wm. McCullough has been engaged to make surveys for an additional supply, and to report in about five weeks, according to reports.

MACUNGIE, PA.—The citizens are reported as in favor of works, and it is stated that the construction will be commenced as soon as a site for a reservoir is selected.

McDONALD, PA.—The Citizens' Water Co. is securing specifications preparatory to asking bids for a $80,000 plant, according to reports.

BERRYVILLE, VA.—The plant of the Berryville Water Co. will be sold under mortgage foreclosure July 6.

BENWOOD, W. VA.—The Benwood Water-Works Co. has been incorporated to secure works; capital stock, $100,000; L. F. Stifle, G. O. Smith, M. J. O'Kane, J. M. Todd, all of Wheeling, W. Va.

PARKERSBURG, W. VA.—The Mountain Home Co. has been incorporated to lay out town sites, build waterworks, etc.; capital stock, $100,000; J. C. Aldersen, J. B. Somerville, Wheeling; D. D. Johnson, and others, Parkersburg.

ELBERTON, GA.—It is stated that estimates for works and an electric light plant have been prepared and are now being considered by the council.

PHOENIX CITY, ALA.—The council is said to be considering the advisability of securing works.

WOODLAWN, ALA.—The question is being discussed, according to reports.

LAWRENCEBURG, KY.—It is reported that the city can secure 45 fire plugs and 18 arc lights for $3,000 per year.

MILLDALE, KY.—W. N. Air, Newport, has contracted with the Kenton Water Co. to lay nearly a mile of extensions.

MORGANFIELD, KY.—Sanders & Porter, Engrs., Louisville, have completed surveys for works and write us that specifications will be prepared at once; supply from deep wells.

CANAL DOVER, O.—Osmond Salmon is reported as interested in proposed works at this place.

CAREY, O.—Bids are asked until Aug. 1 for constructing works, as stated in our advertising columns. H. F. Graves, Pres. Trustees.

CAREY, O.—J. A. Gibbs, Secy., writes us that specifications for proposed works can be had after July 15. Works will include 4 miles of mains, 40 hydrants, and a 16 × 115-ft. stand-pipe. Engr., J. S. Humphrey, Findlay, O.

FREMONT, O.—The proposed issue of $20,000 in water improvement bonds failed to secure the necessary two-thirds vote.

GALLIPOLIS, O.—Contracts have been awarded as follows:

Pipe, S. Pittsburg Iron Co., S. Pittsburg, Tenn.	$23,525
Pipe'l'y'g and tr'ch'g, Andrews & Shields, Hamilton	7,738
Reservoir, A. Tubman, Lexington, Ky.	12,225
Driving tunnel, etc., A. Tubman, Lexington, Ky.	1,823
Gates, Ludlow Valve Mfg. Co., Troy, N. Y.	883
Gate boxes, Ludlow Valve Mfg. Co., Troy, N. Y.	152
Hydrants, Bourbon Copper & Brass Wks., Cinc'nati	1,492

Pumping machinery contract not awarded.

GLENDALE, O.—Bids are asked until July 18 for constructing a masonry foundation and casing for a stand-pipe, and for a stand-pipe, as stated in our proposal columns. Charles B. Going, Secy., United Bank Bldg., Cincinnati.

JACKSON, O.—Works are agitated, according to reports.

LOUISVILLE, O.—The citizens have voted to construct works.

NAPOLEON, O.—Bids are asked until July 21 for the purchase of $60,000 in 5% water and electric light bonds.

STEUBENVILLE, O.—The committee is reported to have recommended that the trustees contract with the E. P. Allis Co. for two pumps, at $31,000.

ALEXANDRIA, IND.—Chas. P. Mattock, Chicago, and J. M. McRae, Alexandria, are interested in the Alex-

andria Water Co., noted last week as incorporated to put in works; capital stock, $60,000.

GOSHEN, IND.—W. G. Clark, Engr., Toledo; E. M. Albright, Cy. Comr.; L. J. Miller, Trustee, and Sam Williamson, Ch. Engr., have investigated Wolf Lake as a proposed source of supply.

HARTFORD CITY, IND.—The Hartford City Water-Works Co. has been incorporated to build works; capital stock, $25,000; directors, F. B. Leopold, W. H. Gable and Chas. W. Cole.

LEAVENWORTH, IND.—Press reports state that $30,000 in bonds will be issued for works; supply from spring in West Leavenworth.

NEW HAVEN, IND.—Bids are asked until July 26 for constructing works. J. B. Benguot, Chn. Trustees.

PORTLAND, IND.—Bids will soon be asked for constructing works to cost $35,000, according to reports. C. W. McLaughlin, Cy. Clk.

DETROIT, MICH.—The Detroit Bridge & Iron Wks. has been awarded the contract for a viaduct over the railway tracks on the boulevard at Dequindre St., at about $13,000.

GRAND HAVEN, MICH.—Wm. N. Angel, Cy. Recdr., writes us that the city is putting in 30 drive wells for additional supply and that additional work may be ordered by the council, but all will probably be done without awarding contracts.

NILES, MICH.—It is stated that the city has sold $32,000 in bonds for new works and that the construction will be commenced at once.

ONTONAGON, MICH.—It is reported that $30,000 in bonds has been voted for a supply.

BLOOMINGTON, ILL.—The board is securing bids for a new 2,000,000 to 4,000,000-gallon pump.

FARMER CITY, ILL.—The city has contracted with Geo. C. Morgan, Chicago, for works, including a 12 × 48-ft. stand-pipe and 8,000 ft. of 8-in. main, at $7,400.

LEXINGTON, ILL.—An election will be held July 17 to vote on an issue of $7,500 in bonds for works.

LAKE MILLS, WIS.—The citizens have voted to issue bonds for works, according to reports.

MILWAUKEE, WIS.—The county board has recommended that the city works be extended to the county poor farm.

TOMAHAWK, WIS.—There is talk of extending the mains across the Wisconsin River to protect the mills.

WAUKESHA, WIS.—Geo. F. Deakin, Supt., writes us that the city will lay about a mile of 4 and 6-in. wrought iron cement lined mains this season. The city buys the shells and does its own cement work.

COON RAPIDS, IA.—J. C. Mening, Cy. Recdr., writes us that the contract for works has been awarded to the U. S. Wind Engine & Pump Co., Batavia, Ill., at $3,637.

FORT DODGE, IA.—The council has accepted plans for new pumps, stand-pipe, etc., estimated to cost $17,000.

BLUE EARTH CITY, MINN.—An election was held July 3 to vote on issuing $15,000 in bonds for extensions.

DELANO, MINN.—The contract for works has been awarded to C. H. Kerr.ck, Delano, at $10,335, according to reports.

FULDA, MINN.—The village has voted to put in works, estimated to cost $10,000.

LAMBERTON, MINN.—G. B. Tretbar, Recdr., writes us that the contract for constructing works has been awarded to the U. S. Wind Engine & Pump Co., Batavia, Ill., at $4,468.

OLATHE, KAN.—The city has notified the state board of charities that it can no longer furnish a supply to the state deaf and dumb asylum, and steps will be taken by the board to secure a supply from wells.

CEDAR RAPIDS, NEB.—W. H. Ellsworth has been engaged to prepare specifications and superintend the construction of works.

PENDER, NEB.—The contract for works was awarded to Goodrich & Robson at $8,400. Work consists of three-fourths of a mile of 8 and 6-in. pipe, 10 × 100-ft. stand-pipe, 600,000-gallon steam pump, feed and heater and 40-HP. boiler. Engr., L. F. Wakefield, Cy. Engr., Sioux City, Ia.

FARGO, N. DAK.—A press report states that the city will issue $40,000 in bonds for extensions and improvements of the works.

MINOT, N. DAK.—Bids are asked by the city clerk until July 16 for constructing works.

WEATHERFORD, TEX.—A. S. Lewis, Cy. Secy., writes us that no definite plan for works has been decided upon.

WEST, TEX.—The West Water Power & Light Co. is reported as negotiating for supplying the citizens with water from an artesian well, pumping to cost $5,000.

SALISBURY, MO.—The question of works is to be voted upon, according to reports.

WESTCLIFFE, COLO.—We are informed that the city is contracting for 4 and 5-in. wrought iron pipe for works; supply from well; population, 500.

GENESEE, WASH.—The citizens have voted, 84 to 20, to issue $15,000 in bonds for works.

TACOMA, WASH.—The county commissioners are reported as considering the question of securing a supply from wells. They are now paying the city $1,080 per year for water.

PORTLAND, ORE.—The following bids were received for furnishing about 43,000 ft. of 18, 20, 24 and 30-in. steel pipe for inlet, outlet and waste pipes for the different reservoirs:

Wolff, Zwicker & Buchner	$119,834
N. J. Bagen	140,469
T. T. Berry	125,845
Robert Wakefield	139,012
San Francisco Bridge Co.	141,779
Risdon Iron Works	139,618
Bullen Bridge Co.	136,935
Hale & Smith	137,558
Hoffman & Bates	139,134
Oregon Bridge Co.	133,345

COLTON, CAL.—It is reported that $65,000 in bonds will be issued for a supply.

MONROVIA, CAL.—At an election June 23 the citizens voted to issue $40,000 in bonds for extending the works.

PORT HOPE, ONT.—The council is considering plans for extensions and improvements estimated to cost $25,000.

IRRIGATION.

O'NEILL, NEB.—The contract for the ditch of the Elkhorn Irrigation Co., noted last week, has been awarded to C. H. Lease & Co., Spencer, Ia., at $5,650; ditch to be 12½ miles long and to be completed by Nov. 1.

CHEYENNE, WYO.—A press report from this city states that the Yellowstone Park Land & Improvement Association, recently incorporated, has made application to the state board of control for a permit to construct the "Omaha canal," and take water for irrigating purposes from the Big Horn River. The company proposes building a canal 42 ft. wide at the top, 30 ft. wide at the bottom, 4 ft. deep and 55 miles long. Ten thousand lineal feet of flume will be required. The total cost of the work will be $200,000. The canal will commence at Terrey post-office in Fremont county.

NEW COMPANIES.—Logan Land & Irrigation Co., Butte City, Mont.; $250,000; to operate in Silver Bow county, Mont., and Logan and Elmore counties, Idaho; Byron H. Cook, J. H. Treftse, W. W. Priestley.

SEWERS.

BELMONT, MASS.—The citizens have voted to build a main sewer, 2½ miles long, to connect with the metropolitan system, cost not to exceed $21,000. One-third of the cost will be paid by private subscriptions.

HUDSON, MASS.—M. M. Tidd, Boston, has been engaged to make plans and specifications for a system.

SALEM, MASS.—The council has appointed a committee to confer with a committee from Peabody for the purpose of improving the sewer systems of both places.

BRIDGEPORT, CONN.—The board of public works has been directed to construct sewers in six streets.

BROOKLYN, N. Y.—Bids are asked until July 11 for constructing a pipe sewer in Dean St. A. T. White, Comr. Cy. Wks.

KINGSTON, N. Y.—The city engineer has been recommended to secure right of way for an outlet sewer for Wards 2 and 9.

NEW YORK, N. Y.—Bids are asked by the commissioner of street improvements of Wards 23 and 24, 2022 Third Ave., until July 17 for constructing sewers in two streets.——The contract for constructing the section of the Jerome Ave. sewer from Featherbed Lane to St. James St. has been awarded to Steward & McDermott, at $100,000.

ROCHESTER, N. Y.—The council has adopted an ordinance for the construction of an outlet sewer, estimated to cost $19,000.

BRIDGETON, N. J.—Ed. M. Fithian writes us that a petition representing more than half of the real estate in the city has been presented to the council for the construction of a system of sewerage and that the council has instructed the ordinance committee to report a sewer ordinance at the next regular meeting, July 10. It is probable that this will be passed in about six weeks and no active steps can be taken before that. Plans for a system were designed by Prof. Chas. McMillan, Princeton, after reports were made by Rudolph Hering and Geo. E. Waring, Jr.

JERSEY CITY, N. J.—The commissioners have adopted an ordinance for constructing a main sewer in West Side Ave.

WOODBURY, N. J.—The council is reported to have adopted plans for a separate system and to have directed the street committee to secure specifications.

ERIE, PA.—The council has passed an ordinance for constructing a main sewer in Parade St.

MEADVILLE, PA.—W.B. Vance, Cy. Clk., informs us that the following bids were received June 26 for constructing proposed sewers:

	Park Ave.	Outlet.
John Sweeney, Pittsburg	$21,049	$2,885
Standard Construction Co., Pittsburg	20,765	1,276
McCarty & Saeger, Cleveland, O.	20,570	.....
Geo. J. Vemer, Youngstown, O.	20,091	*1,257
Corcoran & Connell, Pittsburg	18,691	2,085
Thos. McGuigan, Meadville	17,164	1,639
S. H. & C. DeGroot, Youngstown, O.	16,657	1,648
Jones & Sullivan, Erie	16,443	1,404
O'Donnell & McGowan, Youngstown, O.	16,387	.....
Ulrich, Hirsley & Williams, Springfield, O.	16,159	1,311
G. D. & W. S. Hersey, Youngstown, O.	14,978	1,448
J. W. Mitchell, New Castle, Pa.	*14,414	.....
Reed, Schultz & Co., Port Huron, Mich.	14,045	2,186

*Awarded contract.

PITTSBURG, PA.—The council has adopted ordinances for constructing 18 to 15-in. pipe sewers in eight streets.

SCOTTDALE, PA.—The council is discussing the constructing of a system. S. M. Foust, Borough Engr.

SCRANTON, PA.—The committee has recommended that the contract for constructing sewers in the Tenth district be awarded to John Ferguson, at about $17,000. ——The council has been petitioned to construct a sewer in Webster Ave.

SHARON, PA.—Malin Ewing, Secy., writes us that the committee is corresponding with engineers and obtaining information as to cost of surveys and plans with a view to adopting a system.

SWARTHMORE, PA.—An election will be held July 25 to vote on borrowing $16,000 for sewer and street improvements.

PORTSMOUTH, VA.—W. T. Brooke, Consult. Engr., informs us that the following total bids were received June 23 for constructing the proposed sewers; prices will be published in a later issue:

D. L. Wardrope & Co.	$48,151
Sanford & Brooks	47,701
McGuire & McKnight	60,884
Delany, Brining & McCawley	66,375
Gabory, Noble & Wadleigh	68,358
Rutherford & Brown	76,337
B. I. Coyle	104,526
Graham & Riddle	151,529

JACKSONVILLE, FLA.—W. C. West, Cy. Recdr., writes us that the council is discussing an ordinance for employing an engineer to examine the system and submit plans for extending the same.

BATON ROUGE, LA.—The council is discussing the reconstruction of the system at the penitentiary.

JACKSON, LA.—The board of health has recommended that the outlet sewer be extended to Thompson creek.

COVINGTON, KY.—Press reports state that the lowest bids for constructing the Willow Run sewer were those of Madison Garretson, Cincinnati, at $64,-184; Peter Jonte & Co., $66,726; Patterson & Shipman, $66,000; Scully & Co., Cincinnati, $68,062; Wenat & Wente, $68,106.

NEWPORT, KY.—The city engineer is reported as about to advertise for bids for constructing sewers estimated to cost $41,000.

AKRON, O.—The lowest bid for constructing the Wolf Ledge sewer was that of Daniel McGarry, at $12,377.

CHILLICOTHE, O.—W. M. Dawley, Cy. Engr., has been directed to prepare a drainage map of the city which will be completed about Aug. 1, after which it will be submitted to an engineer to design a sewerage system.

CINCINNATI, O.—The board of administration is considering a resolution to extend the Baldface Road sewer 800 ft., at an estimated cost of $54,754.

SANDUSKY, O.—The council has passed ordinances for constructing sewers in two streets. A. W. Miller, Cy. Clk.

URBANA, ILL.—Bids are asked until July 18 for constructing 11,000 ft. of pipe sewers. Engr., A. N. Talbot, Champaign. G. W. Hubbard, Chn. Com.

WORTH, ILL.—The construction of sewers is being discussed.

APPLETON, WIS.—The council has been petitioned to have sewers constructed in nine streets.

DELAVAN, WIS.—H. M. Sturtevant, Clk., writes us that Dousman & Sheldon, Milwaukee, are preparing plans and specifications for a system.

MARINETTE, WIS.—Bids are asked until July 12 for the purchase of $10,000 of sewer bonds. G. G. Rathbun, Cy. Clk.

RIPON, WIS.—It is reported that Mr. Goodhue, Milwaukee, is making surveys for a system.

ANACONDA, MONT.—The committee has recommended the construction of sewers in six streets.

DENVER, COLO.—It is proposed to construct a sewer in North Capitol Hill; estimated cost, $20,110.

LOS ANGELES, CAL.—The council has adopted ordinances for constructing 12 to 8-in. pipe sewers in 36 streets. D. A. Watson, Supt.

OAKLAND, CAL.—The council is discussing the construction of sewers in two streets.

NIAGARA FALLS, ONT.—John Robinson, Town Clk., writes us that the citizens will vote in August on raising $88,000 for constructing sewers, plans for which have been prepared by Wilis Chapman.

STREETS.

GLOUCESTER, MASS.—The committee has voted to recommend a loan of $25,000 for street improvements.

BROOKLYN, N. Y.—Bids are asked until July 13 for grading and paving Pacific St. with cobblestones, and for improving sidewalks in 14 streets. A. T. White, Comr. Cy. Wks.

BUFFALO, N. Y.—Plans have been prepared for paving Kehr St.

GLOVERSVILLE, N. Y.—E. B. Baker, Engr., writes us that the bids for 16,200 sq. yds. of brick paving published last week have been rejected, and that the work will be readvertised. The contract has been increased to 21,900 sq. yds.

NEW UTRECHT, N. Y.—The commissioner will advertise at once for paving three streets with Belgian blocks and several streets with 6 to 8 ins. of macadam; estimated cost $63,0000. C. Furgeson, Jr., 26 Court St., Brooklyn.——Contracts have been awarded as follows for grading and paving: M. J. Daly, 9 streets, $187,333; J. H. O'Rourke, 7 streets, $58,500; T. F. Burns, 9 streets, $155,154.

NEW YORK, N. Y.—Bids are asked by the commissioner of street improvements of Wards 23 and 24 until July 17 for paving a portion of 161st St. with granite blocks.

NORTH TONAWANDA, N. Y.—The board of trustees has sold $80,285 of bonds for paving Delaware St.

ROCHESTER, N. Y.—The council has adopted an ordinance to pave Chestnut St. with brick, at an estimated cost of $11,000.

SALAMANCA, N. Y.—The citizens have voted to pave Main St. J. B. Swan, Cy. Clk.

EASTON, PA.—The city engineer is taking steps toward paving Northampton St. with brick.

COLLINGDALE, PA.—It is reported that the citizens have voted on borrowing $20,000 for public improvements.

PARSONS, PA.—The council has passed a resolution to issue $25,000 in bonds for street improvements.

PITTSTON, PA.—The paving of Main St. with brick is being discussed; estimated cost about $80,000.

BALTIMORE, MD.—Bids are asked until July 11 for furnishing 450,000 Belgian blocks, 18,600 lin. ft. of 6-in. curbing, and 9,500 lin. ft. of gutter stones. A. E. Smyrk, Cy. Clk.——A committee has been appointed from residents of McCulloh St. and Patterson Ave. to petition the mayor to sign ordinances for paving the above streets with asphalt blocks.

PARKERSBURG, W. VA.—The paving of about 40,-000 sq. yds. with brick is being discussed. J. S. A. Farow, Cy. Engr.

MONTGOMERY, ALA.—Bids are asked until July 23 for paving Dexter Ave. with brick, sheet asphalt or asphalt blocks upon 6 ins. concrete. D. W. Ford, St. Comr.

LUDLOW, KY.—The citizens have voted on issuing $26,000 in bonds for street improvements.

LUDLOW, KY.—A committee is investigating the feasibility of paving the streets with brick. C. P. Bentley, and Thomas Johnson are interested.

ASHLAND, O.—Bids are asked until July 30 for the purchase of $21,000 of 6% street improvement bonds. C. G. Ducomb, Cy. Clk.

NORWOOD, O.—Bids are asked until July 30 for the purchase of street and sidewalk improvement bonds. W. E. Wichgar, Clk., 137 Walnut St., Cincinnati.

SANDUSKY, O.—The council has adopted an ordinance for paving Columbus Ave. with brick. A. W. Miller, Cy. Clk.

TOLEDO, O.—The following bids have been received for paving Oak St.: C. W. McKinney, brick, $27,072; Medina stone, $42,730; cedar blocks, $28,472; H. P. Streicher, asphalt, $64,597; Warren-Scharf Asphalt Paving Co., Trinidad Lake asphalt, $64,459; F. E. Cole, Hallwood blocks, $30,938.

YOUNGSTOWN, O.—Bonds for $14,000 will probably soon be sold for paving East Federal St. with either brick or asphalt.

CHICAGO ILL.—Bids are asked until July 9 for improving portions of 17 streets and alleys. H. J. Jones, Dir. Pub. Wks.

BATTLE CREEK, MICH.—The council is discussing the paving of Main St. with brick.

GRAND RAPIDS, MICH.—Bids are asked until July 12 for $100,000 of 5% street and sewer improvement bonds. The board of public works has awarded the contract for paving South Ionia St. with brick to Jas. McDermott, at $15,000.

PORTAGE, WIS.—The city clerk has been directed to advertise for bids for crushed granite for improving streets.

HOUSTON, TEX.—Resolutions have been introduced for improving sidewalks in 14 streets.

HIGHLANDS, COLO.—The council has postponed the receiving of bids for the purchase of $40,000 in bonds for street improvements.

KANSAS CITY, MO.—The board of public works has approved ordinances for macadamizing Independence Ave. and East 19th St., a total distance of about two miles.

SAN FRANCISCO, CAL.—The city engineer is reported as about to advertise for bids for grading and macadamizing Mission Road.

ELECTRIC LIGHT AND POWER.

CHATEAUGAY, N. Y.—E. S. Goodspeed, Village Clk., writes us that Ernest Douglas has been granted a franchise for an electric light plant.

LANSINGBURG, N. Y.—The water board has been petitioned to establish an electric light plant.

MONTROSE, PA.—An election will be held July 10 to vote on the question of putting in an electric light plant.

TUNKHANNOCK, PA.—It is stated that Boyd & Simpson, Scranton, will put in an electric light plant. Water power at Lake Carey will be used.

BELAIR, MD.—A contract has been awarded to J. H. Reckord, of the Henry Reckord Mfg. Co., to furnish 40 arc lights, at $800 a year. Water power will be used.

KALAMAZOO, MICH.—Bids are asked until July 12 for an electric light plant of 170 lights, and two 125-HP. engines. Chauncey Strong, Cy. Clk.

EAST ALTON, ILL.—It is reported that Smith & Richardson will petition for a franchise to put in an electric light plant.

FORT HOWARD, WIS.—The council has been petitioned to grant a franchise for an electric light plant.

FORT DODGE, IA.—A 25-year franchise has been granted to S. T. Meservey for an electric light plant.

SEDALIA, MO.—Peter Frank petitioned the council some time ago for a franchise to put in an electric light plant, but it was refused, and the matter is again being discused.

NEW COMPANIES.—Sheboygan Gas Light & Fuel Co., Chicago, Ill.; $250,000; Frank Crosby, Frank Rosebrook, Manton Maverick.——Fredericktown Electric & Mfg. Co., Fredericktown, Mo.; $6,000; H. O. Thorst, W. R. Nifong, W. E. Bailey.——Toledo Consolidated Electric Co., Toledo, O.; $100,000.——Johnson Electric Service Co., Milwaukee, Wis.; $150,000.——Ellicottville Electric Heating Co., Buffalo, N. Y.——Barriete Electric Motor & Dynamo Co., New York, N. Y.; $20,000; S. L. Barriette, George Barriette, J. R. Anderson, Frank Adams.——St. George Electric Co., Ltd., St. George, N. B.; $5,000; A. T. Dunn, Dr. William Bayard, A. P. Barnhill.——Osborne Switch Co., Newark, N. J.; manufacturing electrical machinery; $100,000; L. A. Osborne, Daniel Demorest, Henry C. Hines, J. P. Beatty, F. E. Osborne.——Lackawanna Valley Rapid Transit Co., Carbondale, Pa.; manufacturing cables, motors, and all electrical machinery; $10,000; Treas., J. M. Nicol.——Momence Electric Ball Storage Battery Co., Momence, Ill.; $15,000; C. A. Smyth, Lincoln Walker, F. E. Lane.

MISCELLANEOUS CONTRACTS AND SUPPLIES.

DREDGING.—New York, N. Y.—Bids are asked by the department of docks until July 17 for 100,000 cu. yds. of mud dredging.

PARK IMPROVTMENTS.—New York, N. Y.—Bids are asked by the department of parks until July 11 for ten contracts for park improvements, including about 3,600 ft. of railing, lamp posts, etc.; tunnel and drain requiring 800 cu. yds. of rock excavation, 430 cu. yds. masonry, 200 lin. ft. of 12-in. cast iron drain, etc.; steel and bronze filters; floor tiling; constructing roadway, walks, bridge, wall, etc.; furnishing materials for asphalt walks; grading, erecting buildings, etc.; total estimate, $160,000.

WATER POWER.—Drummondville, Que.—Press reports state that capitalists of Montreal are planning to develop the water power of the St. Francis River at this place and that the town council has voted a bonus of $25,000 toward the project.

ARMORY.—Cleveland, O.—The county commissioners received 41 bids for building the new national guard armory, those bidding on the entire work being as follows:

Frank C. Caine & Co	$108,000
D. & G. Greese	114,984
McAllister & Dall	115,373
Phillips & Thomas	124,282
Thomas & Co	95,347
Reaugh & Hunkin	109,890
Gill & Sons	97,555
Hugil & Daykin	115,523
King Bridge Co	119,393
Forest City Iron & Wire Wks. Co	101,200

CANAL.—Oconomowoc, Wis.—Surveys have been made by the Oconomowoc Lake Club for a canal 8 ft. deep and 40 ft. wide at the top to connect the Oconomowoc and Upper Nashohah lakes, about a half mile apart. The difference in elevation is 9 ft. and two locks are proposed.

STONE AND SAND.—New York, N. Y.—Bids are asked by the department of docks until July 17 for about 7,000 cu. yds. of small cobblestone, 23,000 cu. yds. of riprap stone, 4,500 cu. yds. of broken stone and 1,500 cu. yds. of sand.

IRON WORKS, ETC.—Washington, D. C.—Bids are asked until July 25 for the iron furring, lathing, etc., for the U. S. building at Wilmington, Del., as stated in our advertising columns. Jeremiah O'Rourke, Supervising Arch., Treasury Dept.

CONDENSED LIST OF CONTRACTS PENDING, WITH DATE OF OPENING BIDS.

Bids to be opened.	Work.	Place.	See Eng. News.
July 5.	Water-works system,	Waukegan, Ill.	June 21
	Advertised, Eng News, June 21, 28.		
July 5.	Water-works and bonds,	Wilber, Neb.	June 14
July 5.	Paving,	New York, N. Y.	June 28
July 5.	Belgian blocks, etc.,	Baltimore, Md.	June 28
July 5.	Steam road roller,	Cincinnati, O.	June 28
July 5.	Pipe sewers,	Newark, O.	June 28
July 5.	Sewers (23 streets),	Chicago, Ill.	June 28
July 6.	Water-works,	Jefferson, Ia.	June 14
	Advertised, Eng. News, June 14 to 28.		
July 6.	Heat'g, vent'g apparatus,	Ft. Dodge, Ia.	June 14
	Advertised, Eng. News, June 14 and 21.		
July 6.	Heat'g, vent'g apparatus,	Houlton, Me.	June 21
	Advertised, Eng. News, June 21, 28.		
July 6	Sewers (13,067 ft.),	Wooster, O.	June 21
July 6.	Paving,	Wooster, O.	June 21
July 6.	Bridge, Red Wing,	Minn.	June 21
	Advertised, Eng. News, June 21, 28.		
July 6.	Water-works,	Fairville, N. Y.	June 21
July 6.	Brick paving,	Troy, N. Y.	June 28
July 6.	Brick sewers,	Williamsport, Pa.	June 28
	Advertised, Eng. News, June 28.		
July 6.	Paving,	Brooklyn, N. Y.	June 28
July 7.	Water-works,	St. Bernard, O.	June 7
	Advertised, Eng. News, June 7 to 21.		
July 7.	Electric light plant,	St. Bernard, O.	June 7
	Advertised, Eng. News, June 7 to 21.		
July 7.	Street improvements,	Mansfield, O.	June 14
July 7.	Jail,	Des Moines, Ia.	June 28
July 7.	Water-works system,	Glasgow, Mo.	June 28
July 9.	Bridge,	Dallas, Tex.	June 7
July 9.	Plans for city hall,	Peoria, Ill.	June 14
July 9.	Electric wiring,	Dallas, Tex.	June 14
July 9.	Paving,	Meriden, Conn.	June 21
	Advertised, Eng. News, June 21.		
July 9.	Light fixtures,	Washington, D. C.	June 21
July 9.	Pipe, etc.,	Downer's Grove, Ill.	June 21
	Advertised, Eng. News, June 21 to July 5.		
July 9.	Water-works system,	Bellevue, Ia.	June 21
	Advertised, Eng. News, June 21.		
July 9.	Fire engines,	Houston, Tex.	June 21
July 9.	Paving,	Jersey City, N. J.	June 28
July 9.	Pipe sewers (6,980 ft.),	Faribault, Minn.	June 28
July 9.	Paving turnpike,	Newark, N. J.	July 5
July 9.	Paving,	Chicago, Ill.	July 5
July 10.	Bridge,	Cathlamet, Wash.	May 31
July 10.	Masonry arch work	New York, N. Y.	June 14
July 10.	Macadam,	Elizabeth, N. J.	June 21
July 10.	Pipe sewers,	Buffalo, N. Y.	June 28
July 10.	Electric lighting,	Kearney, N. J.	June 28
July 10.	Water-tower,	Toledo, O.	June 28
July 10.	Paving,	Brooklyn, N. Y.	June 28
July 10.	Street improvements,	New York, N. Y.	June 28
July 10.	Stand-pipe and tank,	New York, N. Y.	July 5
July 10.	Highway,	Beardstown, Ill.	July 5
July 11.	Bonds ($3,000,000),	Chicago, Ill.	June 21
July 11.	Pipe sewer,	Brooklyn, N. Y.	July 5
July 11.	Park imp'v'ts,	New York, N. Y.	July 5
July 11.	Belgian blocks, etc.,	Baltimore, Md.	July 5
July 12.	Bridge substr & appr'chs,	Cleveland, O.	June 21
July 12.	Water-works system,	Edwards, N. Y.	June 28
July 12.	Sewers (6 miles),	Bridgeport, O.	June 28
	Advertised, Eng. News, June 28 and July 5.		
July 12.	Pipe, stand-pipe, etc.,	Kirkwood, Ill.	June 28
	Advertised, Eng. News, June 28.		
July 12.	Bridge superstructure,	Winnipeg, Man.	June 28
July 12.	Pipe sewers,	Buffalo, N. Y.	June 28
July 12.	Bridge,	Buffalo, N. Y.	July 5
July 12.	Bridge,	Cambridge, O.	July 5
July 12.	Street bonds,	Grand Rapids, Mich.	July 5
July 12.	Electric light plant,	Kalmazoo, Mich.	July 5
July 12.	Sewer bonds,	Marinette, Wis.	July 5
July 13.	Cobblestone paving,	Brooklyn, N. Y.	July 5
July 14.	Paving,	Akron, O.	June 21
July 14.	Street improvements,	Avondale, O.	June 21
July 14.	Stand-pipe,	Zanesville, O.	June 21
July 14.	Water-wks syst'm,	Northumberland, Pa.	June 28
	Advertised, Eng. News, June 28.		
July 16.	Paving (50,435 sq. yds.),	Dayton, O.	June 21
July 16.	Electric light plant,	Millersville, Pa.	June 28
July 16.	Water-works system,	Grafton, W. Va.	June 28
	Advertised, Eng. News, June 28 to July 12.		
July 16.	Water-works system,	Minot, N. Dak.	July 5
July 16.	Macadamizing highway,	Trenton, N. J.	July 5
July 17.	Stone work,	Newport, R. I.	June 7
	Advertised, Eng. News, June 7 to 28.		
July 17.	Street improvements,	Bucyrus, O.	June 21
July 17.	Water-wks. franchise,	Kaukauna, Wis.	June 28
	Advertised, Eng. News, June 28 to July 12.		
July 17.	Granite paving,	New York, N. Y.	July 5
July 17.	Stone and sand,	New York, N. Y.	July 5
July 17.	Dredging,	New York, N. Y.	July 5
July 17.	Sewers,	New York, N. Y.	July 5
July 18.	Sewers (17,070 ft.),	Dayton, O.	June 21
July 18.	Paving,	Cleveland, O.	June 21
July 18.	Stand-pipe foundation,	Glendale, O.	July 5
July 18.	Stand-pipe,	Glendale, O.	July 5
	Advertised, Eng. News, July 5.		
July 18.	Pipe sewer (11,000 ft.),	Urbana, Ill.	July 5
July 19.	Floor arches, etc.,	Worcester, Mass.	June 28
	Advertised, Eng. News, June 28 and July 5.		
July 20.	Water-works system,	Coxsackie, N. Y.	July 5
	Advertised, Eng. News, July 5, 12.		
July 21.	Paving bonds ($200,000),	Cincinnati, O.	June 28
July 21.	Brick paving,	Cincinnati, O.	June 28
July 21.	Water-works bonds,	Napoleon, O.	July 5
July 23.	Paving,	Montgomery, Ala.	July 5
July 24.	Water-works,	Napoleon, O.	June 28
	Advertised, Eng. News, June 28 and July 5.		
July 24.	Electric light plant,	Napoleon, O.	June 28
	Advertised, Eng. News, June 28 and July 5.		
July 25.	Ironwork, etc.,	Washington, D. C.	July 5
	Advertised, Eng. News, July 5 and 12.		
July 26.	Water-works system,	New Haven, Ind.	July 5
July 28.	Power-house and bldg.,	Detroit, Mich.	June 28
	Advertised, Eng. News, June 28 to July 12.		
July 30.	Street improvement bonds,	Ashland, O.	July 5
July 30.	Street improvement bonds,	Norwood, O.	July 5
July 30.	Highway,	Toledo, O.	July 5
July 31.	Bridge,	New Westminster, B. C.	June 21
Aug. 1.	Sewer bonds ($100,000),	Victoria, B. C.	June 28
Aug. 1.	Water-works system,	Carey, O.	July 5
	Advertised, Eng. News, July 5 and 12.		
Aug. 6.	Electric lighting,	Rome, N. Y.	June 14
Aug. 22.	Drainage canal,	Chicago, Ill.	June 28
	Advertised, Eng. News, June 28 to Aug. 14.		
Sept. 1.	Electric lighting,	Portland, Ore.	June 21
Sept. 3.	Bridge,	Dilton, Mont.	July 5
No date.	Stairway, etc.,	Canton, O.	June 21
	Advertised, Eng. News, June 21, 28.		
" "	Water-works system,	Dansville, N. Y.	June 28
" "	Electric plant,	Jackson, Tenn.	June 28
" "	Artesian well,	Oak Cliff, Tex.	June 28

CONTRACT PRICES.

ELECTRIC LIGHTING.—Baltimore, Md.—The city has contracted with the Maryland Electric Co. for 404 lights in the western district and the Brush Electric Co. for 635 lights in the eastern district, each being the only bidder for lighting its district and bidding 35 cts. per light per night, the maximum price allowed. The lights are to be of 2,000 c. p. and are to burn from sunset to a half hour before sunrise. The companies must maintain a patrol system, by which each lamp is to be examined at least three times in a night. If a lamp is out for a half hour the contractor is to forfeit half pay for that night and if for an hour no pay will be allowed for that lamp for that night.

LAYING BRICK PAVING.—Jacksonville, Fla.—The contract for furnishing the labor and doing the work of paving 15,600 sq. yds. in Main St. with brick has been awarded to I. J. Smith, at 17.99 cts. per sq. yd. The city will furnish all material, and the cost for the entire work will be about $1.08 per sq. yd. The bids recently received for the material and work were published in our issue of June 21.

BRICK PAVING.—Joliet, Ill.—O. R. Rauchfuss, Cy. Engr., writes us that a contract for paving in Exchange St. with two courses of Galesburg brick on 4 ins. of sand has been awarded to Campbell & Dennis, at $1.47 per sq. yd.

New Orleans, La.—The bids for paving in Clinton St. with vitrified brick ranged from $2.85 to $3 per sq. yd.

Niagara Falls, N. Y.—The bids received last week for brick paving ranged from $1.75 to $2.98 per sq. yd., the bid of R. D. Young and John W. Ward being as follows:

Mack Mfg. Co., U. S. fire clay,	per sq. yd.			$2.29
Vitrified fire clay,	"	"	"	2.39
Shale block,	"	"	"	2.38
Shale block repressed	"	"	"	2.31
Canton block,	"	"	"	2.40
Canton royal cut	"	"	"	2.43
Canton end cut,	"	"	"	2.42
Canton standard,	"	"	"	2.42
Canton standard repressed,	"	"	"	2.38
Canton standard end cut,	"	"	"	2.37
Park fire clay,	"	"	"	2.28
Park block,	"	"	"	2.29

Dunkirk, N. Y.—J. M. Hackett, Cy. Engr., writes us that the contract for about 20,000 sq. yds. of paving with a vitrified fire clay brick upon a concrete foundation was awarded June 28 to Jacob Rider, Dunkirk, at the following prices:

All excavation, per cu. yd.	$0.25
Paving, complete, per sq. yd.	1.41
Curbing, furnished and set, per lin. ft.	0.34
Curbing, reset,	0.20
Circular curb,	1.25
Drain tile,	0.08
Stone walks, relaid,	0.20

WOOD PAVING.—Milwaukee, Wis.—A contract for paving 1,933 sq. yds. of Fourth St. with cedar blocks has been awarded to W. T. McGovern, at $1.01 per sq. yd.; 520 lin. ft. of stone curbing, at 52 cts. per ft.

STONE.—Irvington, N. J.—A contract for a supply of mountain stone has been awarded to John S. Woodruff, at $1.50 per ton delivered in any part of the village.

SEWERS.—Des Moines, Ia.—Ed. Wright, Chn. Bd. Pub. Wks., writes us that the following bids were received June 23 for construcing 11,000 ft. of 48-in. brick sewer; contract not to be awarded for two weeks and if at all to the lowest bidder:

King & Kennedy, Des Moines, per lin. ft.	$5.80
John Hurley & Co., " " " " "	8.65
Likes & Rourk, " " " " "	5.91
Tim O'Brien & Co., " " " " "	10.33
Kavanagh & O'Connell, " " " " "	4.47
M. H. King, " " " " "	4.93
P. McDonald, " " " " "	5.48

Sheboygan, Wis.—A contract has been awarded to (4) Wm. Schaetzer at $7,129, the other bidders being: (1) N. F. Reichert & Co., $8,881; (2) John Braun, $8,502; (3) J. Werner, $7,612. The prices were as follows:

		1.	2.	3.	4.
30-in. brick,	per lin. ft.	$3.65	$2.87	$2.75	$2.45
24-in. "	" " "	2.90	2.50	2.70	2.45
18-in. pipe,	" " "	1.25	1.11	1.25	1.10
15-in. "	" " "	1.15	.94	1.00	1.10
10-in. "	" " "	.80	.75	1.00	.75
Catchbasins,	each	30.00	35.00	40.00	32.00
Manholes,	"	30.00	30.00	20.00	32.00

Saginaw, Mich.—Udo Hesse, Asst. Cy. Engr., writes us that the following contracts for sewers were awarded June 23: Hof and Ave. sewer, from Warner St. to Genesee Ave., awarded to John C. Davies at the following prices per foot:

20 × 30-in. single ring brick,	cut 17 ft. 7 ins. at	$1.35
18 × 27-in. " " "	16 ft. 3 ins. "	1.25
16 × 24-in. " " "	14 ft. 6 ins. "	1.00
15-in. pipe* sewer,	12 ft. 0 ins. "	0.40

Mott St. sewer, from Woodcock Ave. to Emily St., awarded to Eddy & Hildebrand:

12-in. pipe* sewer, cut 11 ft. 8 ins., at $0.25.

Harrison St. sewer, from Clinton St. to Hancock St., awarded to Eddy & Hildebrand:

15-in. pipe* sewer, cut 10 ft. 0 ins. at $0.27.
12-in. " " " 9 ft. 6 ins. " 0.24.

Mason St. sewer, from Court St. to Clinton St., awarded to Wm. A. Armstrong:

15-in. pipe* sewer, cut 10 ft. 6 ins. at $0.27.
12-in. " " " 9 ft. 9 ins. " 0.23.

* Pipe furnished by the city.

BOILERS.—Troy, N. Y.—The "Times" states that the following bids were received for two horizontal return tubular boilers of 175 H.P. each, for the water-works: C. H. Sather.and, of the Franklin Iron Wks., $4,950; Pinkerton & Mull, Green Island, $4,800.

WATER-WORKS.—Brunswick, Mo.—P. Canfield Barney, Consult. Engr., Chillicothe, Mo., writes us that the lowest bids for the water-works were as follows: 8 to 4-in. pipe, $19.50 per ton of 2,000 lbs.; specials, 2¼ cts. per lb.; stop gate valves, 6-in. at $11.40, 8-in. at $15.94; hydrants, 6-in. and 4-in. at $19.00; pipelaying, including hauling from cars, lead and oakum, 8-in. at 14 cts. per ft., 6-in. at 12 cts., 4- n. at 10 cts.; stand-pipe. 10 × 50 ft., erected on foundation, $985; 500,000-gallon duplex pump, $405; two 50-HP. boilers, $1,179. The total bid for the water and electric light plant was $10,600 and let to the Franklin Electric Co., as stated in our issue of June 21.

METAL MARKET PRICES.

LEAD.—New York: 3.37 to 3.4 cts. Chicago: 3.15 to 3.2 cts. St. Louis: 3.15 to 4.1 cts.

NAILS.—Pittsburg: $1.10 for wire, and 90 cts. for cut at mill, in carload lots.

FOUNDRY AND PIG IRON.—New York: $10 to $13. Pittsburg: $10.75 to $11.75. Chicago: $10 to $11.50.

TRACK MATERIAL.—New York: angle bars, 1.2 to 1.4 cts.; spikes, 1.5 to 1.7 cts.; track bolts, 2 to 2.1 cts. with square and 2.1 to 2.3 cts. with hexagon nuts. Chicago: angle bars, 1.25 to 1.35 cts.; spikes, 1.7 to 1.8 cts.; track bolts, 2.1 to 2.15 cts., with hexagon nuts.

RAILS.—New York: $24 to $25 at eastern mills and at tidewater; old rails, $10 to $11 for iron, and $8.50 to $9 for steel; steel rails fit for relaying, $16 to $16.50; light rails, $22 to $24; girder rails, $21 to $24. Pittsburg: $24 for standard sections. Chicago: $25 to $27; old rails, $10 for iron and $6.50 for steel.

STRUCTURAL MATERIAL.—New York: beams, 1.4 to 1.5 cts.; channels, 1.4 to 1.5 cts.; angles, 1.3 to 1.35 cts.; tees, 1.5 to 1.6 cts.; universal mill plates, 1.25 to 1.35 cts.; steel plates, 1.35 to 1.4 cts. for tank, 1.45 to 1.5 cts. for shell, 1.6 to 1.65 cts. for flange, 1.75 to 2 cts. for ordinary firebox, 2 to 2.25 cts. for locomotive firebox. Pittsburg: beams, 1.25 to 1.35 cts.; channels, 1.25 to 1.35 cts.; angles, 1.2 to 1.25 cts.; tees, 1.35 to 1.4 cts.; universal mill plates, 1.2 to 1.25 cts.; steel plates, 1.25 to 1.3 cts. for tank, 1.4 to 1.5 cts. for shell, 1.45 to 1.6 cts. for flange, 2 to 4 cts. for firebox. Chicago: beams, 1.45 cts.; channels, 1.45 cts.; angles, 1.4 cts.; tees, 1.6 cts.; universal plates, 1.45 cts.; steel plates, 1.45 to 1.5 cts. for tank, 1.5 to 1.6 cts. for shell, 1.65 to 2.1 cts. for flange, 2.5 to 5 cts. for firebox.

IRON MARKET.—The "Iron Age" report from Pittsburg says that the most unfavorable feature in the whole situation in the iron and steel trades at this time is the light demand for finished material, and which shows no immediate signs of getting larger. Buyers naturally expect that a general resumption of operations among mills that closed for want of fuel will cause prices to sag, and they will hold off placing orders as long as they can. The hot weather is interfering with the starting up of some of the mills, while others have not been able as yet to get enough coal in stock to allow them to resume. While most of the mills, or all of them, have some old orders to clean up, there must be a very large increase in demand before steady work all around is assured. Summed up, the situation is not as encouraging as it might be, but there are plenty in the trade who believe that the last half of the year will show improvement over the first half, both in demand and prices.

INDUSTRIAL NOTES.

THE PRESCOTT STEAM PUMP CO., of Duluth, Minn., will establish works at Milwaukee, Wis.

THE WILLIAMS PALACE CAR CO., of St. Joseph, Mo., proposes to establish works at St. Joseph, but no arrangements have been made as to running the cars if built. The special features are said to be the use of aluminum in the upper berth framing, air-inflated mattresses, and upper berths occupying less space than those of ordinary pattern.

THE HARVEY STEEL CAR & REPAIR WORKS, of Harvey, Ill., have a contract to repair from 300 to 500 refrigerator cars, and have received an order for six steel flat and six box cars, for a narrow gage railway in South America.

NEW COMPANIES.—Guggenheim Smelting Co., Perth Amboy, N. J.; $2,000,000, commencing with $5,000; Isaac Guggenheim, 45 Cedar St., New York, N. Y.——Aztec Oil Co., Charleston, W. Va.; $500,000 commencing with $500; to bore for oil and gas; B. F. Warren, Brooklyn, N. Y.; Marshall Ayers, New York ——Sanative Refuse Co., Jersey City, N. J.; $100,000, commencing with $1,000; garbage disposal; W. S. Pierce, New York; W. V. Clark, Hackensack, N. J. ——Gas, Heat & Power Co., Mechanicsburg, Pa.; $50,000, commencing with $5,000; Treas., A. Z. Meyers. ——Bellwood Gas Co., Bellwood, Pa.; $1,000 with $100 paid in; Treas. P. W. Janeway.——Kittanning Iron & Steel Mfg. Co., Kittanning, Pa.; $3,500, with 10% paid in; Treas., Henry A. Colwell.——Electric Boiler Co., Rochester, N. Y.; $50,000; J. Henry Howe, W. T. Bassett and C. S. Hopkins.——Florida Dredging Co., Jacksonville, Fla.; $100,000; M. S. Carter, St. Louis; J. A. Bryan, Tampa, Fla.; A. D. Stevens, Jacksonville, Fla.——Porter Nut Lock Co., Chicago, Ill.; $150,000; Benjamin Porter, C. W. Porter, and T. M. Evans. ——Penn Railway Supply Co., Pittsburg, Pa.; $1,000, with 10% paid in; Treas., Henry S. Mould.——Osborne Switch Co., Newark, N. J.; $100,000, with $36,000 paid in; electrical appliances, etc.; L. A. Osborne, Daniel Demarest and J. P. Beatty.——Spencer Motor Co., Glastonbury, Conn.; to manufacture water motors, etc.; I. H. Spencer, E. H. Betts, E. S. Kibbe.

THE NATIONAL SWITCH & SIGNAL CO., of Easton, Pa., has been awarded the contract for installing the system of interlocking at the crossing of the Chicago, St. Paul, Minneapolis & Omaha Ry. with the Northwestern Coal Ry., at East Superior, Wis.

THE SECKNER CONTRACTING CO., Unity Building, Chicago, has the contract for erecting a 175,000-bushel grain elevator, with machinery, for the Lessler Timber Lake Co., Chicago. Also for building the Chicago Lawn Sanitarium Hotel, to cost $98,000. Other work on hand includes additional mains to the water-works system at Park Ridge and Evanston, and a complete system of water-works for East Chicago, Ind.

THE YOUNGSTOWN BRIDGE CO., of Youngstown, O., has the contract for a two-span four-track bridge for the Baltimore & Ohio R. R. at Bessemer, Pa.; a suspension bridge with eyebar cables, and two braced arch spans over Mill Creek Canon in Mahoning county, Ohio, and a large head frame for shipment to Salt Lake City, Utah. It has also several large contracts at Springfield, Ill., Bell county, Tex., and among other work several spans in Oregon, and some truss work for the American Sugar Refining Co., at New Orleans.

THE RICE & SARGENT CO., of Providence, R. I., has been incorporated to manufacture and sell steam engines. Pres., R. A. Robertson; Secy., John W. Sargent. The office is at 40 Codding St.

MUNICIPAL BOND MARKET.

NEW YORK, July 2, 1894.

The municipal bond market during the week ending to-day is in marked contrast to the state of affairs noted last week. Activity continues despite the high prices that have been touched by the most desirable issues, but, while a week ago there were heavy blocks of bonds disposed of by several of the large cities of the Union, there have been no notable sales made this week by municipalities with the possible exception of an award of $750,000 Rochester 3½s at a price averaging 100⅝. It might be well to record that $250,000 of this issue was received by Blake Bros., the bankers, of this city, the rest going to Rochester people.

Dealers report that the demand for municipal bonds is as strong as ever. The New York houses, Harvey Fisk & Sons and N. W. Harris & Co., who were the successful bidders for a good part of the recent big Philadelphia and Chicago issues, report that these bonds are going off very well. The market for all purchasable bonds is, however, just now being made only by investors, as institutions are at the end of their fiscal years, and banks and trust companies need all of their money to pay interest on coupons and deposits due July 1 and after.

When investors receive the interest and dividend disbursements now being made, aggregating in the cities of New York, Boston, Philadelphia, Chicago and Baltimore some $125,000,000, what might be called the retail market of municipal bonds will show even greater activity than is now displayed. As it is, dealers supply the wants of customers with difficulty, and competition among bidders for new lots placed on the market is so unusually keen, and premiums have reached a point where the net return to the investor runs all the way from 3½ to 4½ per cent. With all this new investing capital upon the market and the banks and trust companies freed of the necessity of looking out for interest payments a new impetus must be given to the municipal bond market.

Prices continue to rule at prime figures, and most of the New York houses report a profitable business for June, way in excess of what was done in a like period last year. Whether or not still higher prices will be touched is a question on which there is a wide difference of opinion. It is claimed by some that the limit has about been reached, and that with an improvement in the business situation investors will be able to obtain more favorable terms. An expert says that this is extremely doubtful, for some time to come at least, anyhow. He remarks that under the most favorable circumstances it will take months to use up the present accumulation of idle money in the country, or enough of it to harden rates to such an extent as to affect bond premiums materially. The low rates obtainable for money make even the highest priced bonds attractive forms of investment, while the market is kept bare of anything good that will net a return of 4 per cent. Most firms are taking a hopeful view of the situation, and, despite the dullness reigning everywhere, expect bond prices to go higher. The following quotations will indicate to contractors and other interested parties the credit obtainable by various towns and cities:

MUNICIPAL BONDS.

	Price.
School District No. 6, Kings Co., N.Y., 6s	108⅛
City of Pueblo, Col., Gen. Fund Gold 6s	113
County of Flathead, Mont., Funding Gold 6s	107⅝
City of Bartow, Fla., 20-year 6s	102
Fergus County, Mont., Gold 6s	106
City of Bethany, Mo., Water-Works 6s	105¾
Teton County, Mont., Funding 6s	100
Meridian, Miss., Sewer 6s	107½
Park County, Mont., Funding 6s	109½
City of Dallas, Tex., Street Imp. 6s	110⅛
Bexar County, Texas, Court House 6s	107½
City of Newport, Ky., 5s	106½
City of Cheboygan, Mich., Water-Works 5s	104
City of Galveston, Tex., 5s	100½
City of Omaha, Neb., City Park 5s	111
City of Jefferson, Ia., Water Works 5s	102⅝
City of Hastings, Neb., Water Works 5s	102
Jersey City, N. J., Gold Coupon 5s	109
City of Dayton, O., School 5s	107½
County of Portage, Wis., Refunding 5s	107½
City of Sheldon, Ia., School 5s	101½
City of Waco, Tex., Gen. Fund 5s	100
Town of New Utrecht, Kings Co., N. Y., 5s	101¾
City of Brooklyn, N. Y., Pub. Market 4s	110.45
School Dist. No. 1, Suffolk Co., N. Y., 4s	103
City of Derby, Conn., 20-yr. Funding gold 4s	102½
City of South Norwalk, Conn., Funding 4s	102½
City of Boston, Mass., 4s	109⅜
Manchester, N. H., Imp. 4's	106½
Methuen, Mass., Water 4s	107
City of Everett, Mass., Water 4's	107
City of Chicago, Refunding Gold 4's	104¼
City of Cleveland, O., Funding 4's	104⅜
Hennepin County, Minn., 4½'s	106½
City of Rochester, N. Y., Water 3½'s	101¾

RAILROAD STOCK MARKET.

NEW YORK, July 2, 1894.

It is a "strike" market, not that railroad stock values have as yet been seriously affected by the ill-advised campaign now being directed against the industries of the country by the American Railway Union. Considering the magnitude of the trouble and the losses and annoyances it has already occasioned the roads centering at Chicago, the effect on prices has been disproportionately small. That this is so is primarily due to the narrowness of the market. Utterly professional as the trading is, the appreciation by investors of the trouble has not yet entered as a factor in the situation, and, outside of sporadic attempts on the part of speculators to take advantage of the distressing development of last week, the railroad stock market has been acting independently of outside influences such as would have, under ordinary circumstances, produced complete demoralization.

Nevertheless the big railway employes' strike overshadows every other element in the situation as completely as the bituminous coal miners' strike some weeks ago engaged Wall Street's attention to the detriment of all other circumstances co-existent but less important. That the war now being waged against the public—for so has the "strike" developed—was ill-conceived, criminal of execution and certain of ignominious failure is easily apparent. The genuine cause of the whole uprising—it is rank rebellion against law and order—has long since been lost sight of. It has developed into a determination as to whether owners or employes are to be masters of a property, and to such a struggle there can be but one outcome. But in the mean time enormous losses are being entailed. Here is the Rock Island road officially announcing the discontinuance of *all* trains. The St. Paul's whole train service is interfered with and demoralized, because it is forced by contract to operate seven or eight of the boycotted Pullman cars on but one of its divisions. Three days after the strike began Chairman Egan, of the Railroad Managers' Association, estimated that it was then already costing the railroads $250,000 a day. It is costing more than $1,000,000 a day now, and a good deal more than that to the strikers. Their defeat is certain, but the strike is an object lesson as to the worth of labor organization as perfected in this country. Ex-Grand Master of the Knights of Labor, Terence V. Powderly, said within the last day or two that he never in his career ordered a strike, because they always failed. And statistics prove that 99 per cent. of the strikes declared within the last decade in this country have failed ingloriously.

Railroad earnings so far do not betray any effects from the strike; there hasn't been time enough for that. On the other hand most of the exhibits made for May are surprisingly good. True, there is the Burlington, which failed to earn even fixed charges, much less something on the stock, by over $85,000, but this is counteracted by the showing of the St. Paul that it has more than earned in the fiscal year the 4 per cent. dividends on the common stock. The Eastern trunk lines show up especially well, considering the unfavorable conditions that prevailed. The Pennsylvania, Reading and Erie show decreases in net earnings when compared with a year ago of 43, 15 and 30 per cent., yet these figures are all better than was anticipated.

There is not much cheerfulness to the situation. The strike must soon end, but before so doing, it will have wrought incalculable damage, have retarded commercial progress to an immeasurable degree, and have nipped in its incipiency a movement toward higher prices, begun by large European purchases that must soon have dissipated its cheering influence to the spread of confidence in all directions.

Railroad stocks.	Closing prices, July 2.
Alton & Terre Haute	32
Atch., Topeka & Santa Fé	5
Baltimore & Ohio	70
Canada Southern	48
Ches & Ohio	16¼
Chic., Burl & Quincy	76⅞
Chic. & Northwestern	105¼
Chic., Mil. & St. Paul	59⅝
Chic., Rock Island & Pac.	60¾
Clev., Cin., Chic. & St. Louis	35½
Del., Lack. & Western	160
Delaware & Hudson	128¾
Lake Shore & Mich. South	124¼
Louisville & Nashville	44⅛
Missouri Pacific	25⅝
Missouri, Kansas & Texas	12
Mobile & Ohio	18
New Jersey Central	107
New York Central	96⅜
New York & New England	51½
N. Y., New Haven & Hartford	175
N. Y., Chic. & St. L., 1st pfd.	60
N. Y., Lake Erie & Western	13
N. Y., Ontario & Western	14¾
New York, Sus. & Western	4¼
Northern Pacific	3½
Northern Pacific pfd.	17⅞
Phil & Reading	16⅛
Richmond Terminal	10⅝
St. Paul & Omaha	35
Southern Pacific	18
Texas Pacific	8
Union Pacific	10⅝
Wabash pfd	13½
Wheeling & Lake Erie	10¾

BOSTON RAILROAD STOCKS.

	July 2.
Boston & Albany	199
Boston & Maine	147
Fitchburg	141-39
Old Colony	179½

PHILADELPHIA RAILROAD STOCKS.

	July 2.
Lehigh Valley	37
Pennsylvania Railroad	48¼

Sanitary District of Chicago.

TO CONTRACTORS.

Sealed proposals addressed to the Board of Trustees of the Sanitary District of Chicago, and indorsed "Proposal for Excavating a Portion of the Main Drainage Channel," will be received by the Clerk of the said Sanitary District at Room H, Rialto Building, Chicago, Ill., until 12 m. (standard time) of Wednesday, the 22d day of August, 1894, and will be publicly opened by the said Board of Trustees at the regular meeting held that day, or at a special meeting called for that purpose.

The work for which the said tenders are invited is the excavation of that portion of the main drainage channel for the said Sanitary District, known as contract section fifteen (15), extending from station 1,480 to station 1,520, and consists in all of about 639,000 cubic yards of rock, of about 35,300 cubic yards of earth, and the building of 40,000 cubic yards of retaining walls.

Each proposal to be accompanied by a certified check or cash to the amount of $5 000.

All certified checks to be drawn on some responsible bank doing business in the City of Chicago, and be made payable to the order of the Clerk of the Sanitary District of Chicago. Said amount of $5,000 to accompany each bid will be held by the Sanitary District until all of said proposals have been canvassed and contracts awarded and signed, the return of said check or cash to the bidder to whom said work shall have been awarded being conditioned upon his appearing within ten days after notice of such award being given, with bondsmen, and executing a contract with the Sanitary District for said work so awarded, and giving a bond satisfactory to the Board of Trustees for the fulfillment of the same in the amount of $100,000.

All proposals must be made upon the blank forms furnished by the Sanitary District, and must give the price for each separate item of work.

The bids will be compared on the basis of the Engineer's approximate estimate of quantities, which will be furnished with copies of the specifications.

No proposal will be considered unless the party making it shall furnish evidence satisfactory to the Board of Trustees of his ability to do the work, and that he has the necessary pecuniary resources to fulfill the conditions of the contract, provided such contract shall be awarded him.

Bidders are required to state in their proposals their individual names and places of residence in full.

Specifications and plans may been seen at the office of the Chief Engineer, Rialto Building, Chicago, Ill.

The said Board of Trustees reserves the right to reject any and all bids.

THE SANITARY DISTRICT OF CHICAGO.
By FRANK WENTER,
President of its Board of Trustees.

Attest:
THOS. F. JUDGE, Clerk.
Chicago, Ill., June 20, 1894 26-8t

NOTICE TO CONTRACTORS.

Sealed proposals will be received by the Village Board of Downer's Grove, Ill., until 8:00 o'clock P. M., July 9, 1894, for the following material and work required to complete a water-works system:

1 930 ft. of 12-in. cast iron pipe, 3,990 ft. of 10 in. pipe, 7,330 ft. of 8-in. pipe, 30 hydrants, 11 gate valves and boxes, a standpipe and ground reservoir.

Proposals will be submitted on blanks furnished by the Village, and may be for any or all material or for any or all labor, or for both material and labor, as set forth in the different sections of proposals.

All proposals must be sent to the Chairman of Improvement Committee, and be accompanied with a certified check payable to the Village Treasurer of Downer's Grove, Ill., for a sum equal to 3% of the amount of proposal, provided that no check shall be less than $50.

The Board reserves the right to reject any and all proposals.

Plans and specifications may be examined at Carpenter's drug store, Downer's Grove, Ill., or at the office of the Engineer, W. S. Shields, 100 Washington street, Chicago.

By order of the Board of Trustees of said village,

W. S. CARPENTER, President.
GEO. T. HUGHES, Clerk.
G. L. BUSH, Chairman Imp. Com.,
25-3t Downer's Grove, Ill.

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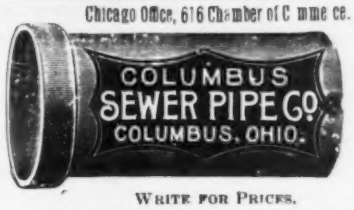

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PROPOSALS FOR WATER-WORKS MATERIAL.

The Board of Trustees of the Village of Kirkwood, Illinois, will receive sealed bids for all cast-iron pipe, hydrants and valves, pumping machinery and boiler, f. o. b. cars Kirkwood, also a steel standpipe erected on the foundation furnished by the village, until 7 o'clock P. M., July 12th, A. D. 1894. Specifications for the entire works may be obtained of the village clerk or consulting engineer, and plans seen at Kirkwood or the engineer's office after July 24.

A certified check of $200 on some national bank made payable to the order of the village treasurer of Kirkwood, Ill., must accompany each bid. The village reserves the right to reject any or all bids.

C. H. MUNDORFF,
President.
R. L. EVERETT,
Clerk.
CHAS. F. STURTEVANT,
Consulting Engineer,
800 North 2d street,
St Louis, Mo. 26 2t

TREASURY DEPARTMENT.—Office Supervising Architect, Washington, D. C., June 20, 1894.—Sealed proposals will be received at this office until 2 o'clock P M. on the 19th day of July, 1894, and opened immediately thereafter, for all the labor and materials required for the brick and terra cotta floor and ceiling arches, concrete filling, terra cotta furring, etc., for the U. S. Post Office building at Worcester, Mass., in accordance with the drawings and specification, copies of which may be had at this office, or the office of the Superintendent at Worcester, Mass. Each bid must be accompanied by a certified check for a sum not less than 2 per cent. of the amount of the proposal. The right is reserved to reject any or all bids or to waive any defect or informality in any bid should it be deemed in the interest of the Government to do so. All proposals received after the time stated will be returned to the bidders. Proposals must be inclosed in envelopes, sealed and marked, "Proposal for Floor Arches, Concrete Filling, etc., for the U. S. Post Office, etc., Building at Worcester, Mass.," and addressed to JEREMIAH O'ROURKE, Supervising Architect. 26-2t

U. S ENGINEER OFFICE 34 WEST CONgress St., Detroit, Mich., June 28, 1894.—Sealed proposals for Power House and Office Building for the 800-ft. lock, St Marys Falls Canal will be received here until 2 P. M., July 28, 1894, and then publicly opened. Information furnished on application. O. M. POE, Col. Corps of Engrs. 26-3t

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NOTICE TO CONTRACTORS.

BRICK PAVEMENT.

Sealed proposals will be received by the city of Poughkeepsie, N. Y., at the Chamberlain's office in said city until 7 P. M., Monday, the 2d day of July, 1894, for furnishing and laying a vitrified brick pavement on Main street from Clover to Washington street in said city.

Each proposal must be accompanied by a certified check payable to the order of the city of Poughkeepsie, N. Y., for the sum of $500.

Specifications, form of proposal and contract may be obtained at the office of City Chamberlain.

Nine hours will constitute a day's labor and only citizens of the United States to be employed.

The right is expressly reserved to reject any or all proposals.

Proposals must be made upon forms obtained as above and must be indorsed, "Proposals for Brick Pavement."

By order of the Common Council.
JOHN J. RUDDY,
26-1t City Chamberlain.

WATER-WORKS AND ELECTRIC LIGHT PLANT.

Sealed proposals will be received by the Board of the Water-Works Trustees of Napoleon, O., up to noon Tuesday, July 24, 1894, for the material and construction of a complete water-works and electric light plant for the village of Napoleon, O. One brick building for the entire plant; one brick stack, 75 ft. high. Water-works machinery: two 1,000,000-gallon pumps; about 8 miles of pipe 14 to 4; 72 hydrants, etc., and two boilers. Electric machinery: two 100 HP. engines; one 60 arc light dynamo, and one 1,500 incandescent light dynamo, including first-class plant. One stand pipe 20 by 125 ft.

Information and specifications can be had of
JOSIAH KOLLER,
Secretary of Water-Works Bd.
H. C. GROSHNER, President.
J. B. STRAWN, Salem, O., Engineer.
26-2t

NOTICE TO WATER-WORKS CONTRACTORS.

On the 17th day of July, 1894, the city of Kaukauna, Outagamie County, Wisconsin, will let a franchise to the lowest and best bidder for the construction of a water-works system. The city will contract for 90 hydrants Population, 6,000; for further particulars address City Clerk, Kaukauna, Wis.

26-3t H. B. TANNER, Mayor.

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PROPOSALS FOR WATER-WORKS, CAREY, O.

Sealed bids will be received by the Trustees of the Carey Water-Works, Carey, O., at their office until 12 o'clock noon, standard time, of Wednesday, Aug. 1, 1894, for material and performing the necessary labor for the construction of a complete system of water-works, approximately as follows:

1.—A brick building with stone foundation, for a pumping station.

2.—For two compound duplex pumps of a capacity of 500,000 galls. each per 24 hours.

3.—For furnishing and setting up complete two steel tubular boilers, including boiler feeder, heater, and all necessary appurtenances.

4.—One stand-pipe, 16 ft. in diameter, 115 ft. high.

5.—Stand-pipe foundation.

6.—Cast iron water-pipe, varying from 12 ins. to 4 ins. in diameter. Approximately four miles of pipe will be required, including specials for same.

7.—Forty-eight valves and valve-boxes.

8.—Forty fire hydrants.

9.—For laying approximately four miles of water pipe including the setting of all valves, valve boxes and hydrants, including also the work of trenching and back filling the same.

Bids will be received upon the whole or on any division of the work above set forth. Each proposal must be signed by all persons interested therein, and must be accompanied by a good and sufficient bond, satisfactory to the Trustees, in the sum of five hundred dollars ($500) for each item bid upon, and for one thousand dollars ($1,000) if the bid is upon the construction of the whole plant, as a guaranty that the bidder will enter into contract if the contract shall be awarded him. Cash or certified checks will be received in place of bond if the bidder so elects.

The Trustees reserve the right to reject any or all bids, or to accept such bids as in their judgment offer material or machinery best adapted to the service for which it is required, and to that end reserve the right to carefully examine, determine and be governed by the measure of economy in current performance of machinery offered, its durability, perfect action and general adaptability to their wants and requirements. Specifications and forms for bidding can be had of the Secretary after July 15, 1894. Plans will also be on file in the office of the Secretary after that date.

Signed { H. F. GRAVES, President.
GEORGE ASH,
J. A GIBBS, Secretary,
27-2t Water-Works Trustees.
J. S. HUMPHREY, Designing Engineer.

COXSACKIE, NEW YORK, WATER WORKS.

NOTICE TO CONTRACTORS.

Sealed proposals will be received by the Village of Coxsackie, N. Y., to 8 p. m. of July 20, 1894, for furnishing the materials and constructing a system of water-works for said village.

There will be required about 852 tons of cast iron pipe, 8 tons of special castings, 45 fire hydrants, 32 gate valves, 30 valve boxes, a concrete reservoir dam, etc.

Bids will be received for furnishing materials above or for constructing the works complete. Proposals must be addressed to the President of the Board of Trustees, and must contain a certified check or its equivalent, made payable to the President of the Board of Trustees of Coxsackie, N. Y., in an amount equal to two (2) per cent. of the amount of the bid.

Plans may be seen and specifications and blank forms of proposal procured at the office of the village clerk, Coxsackie, N. Y., or at the office of the engineers, Voorhees & Wetmer, Rooms 65 and 66 Chapin Block, Buffalo, N. Y.

The right is reserved to reject any and all bids.

THOS. B. ALCOTT,
President Board of Trustees.
WILLIAM K. REED,
Village Clerk. 27-2t

PROPOSALS FOR STAND-PIPE.

Proposals for furnishing and erecting upon its foundation a stand-pipe for the village of Glendale, Ohio, will be received by the trustees of the water works of said village at the office of the secretary, United Bank Building, Cincinnati, Ohio, up to noon of Wednesday, July 18, 1894.

Specifications and blank forms for proposals will be furnished upon application to CHAS. B. GOING, Secretary, United Bank Building, Cincinnati, Ohio. 27-1t

For Other Proposals see Page XX.

TREASURY DEPARTMENT, OFFICE Supervising Architect, Washington, D. C., June 28th, 1894.—Sealed proposals will be received at this office until 2 o'clock P. M. on the 25th day of July, 1894, and opened immediately thereafter, for all the labor and materials required for the iron furring, lathing, plastering, etc., for the United States Court House and Post Office at Wilmington, Delaware, in accordance with the drawings and specification, copies of which may be had on application at this office, or the office of the Superintendent at Wilmington, Delaware. Each bid must be accompanied by a certified check for a sum not less than two per cent. of the amount of the proposal. The right is reserved to reject any or all bids, and to waive any defect or informality in any bid should it be deemed in the interest of the government to do so. All bids received after the time stated for opening will be returned to the bidders. Proposals must be inclosed in envelopes, sealed, and marked, "Proposal for Iron Furring, Lathing, Plastering, Etc., for the United States Court House and Post Office at Wilmington, Delaware," and addressed to JEREMIAH O'ROURKE, Supervising Architect. 27-2t

U. S. ENGINEER OFFICE, NEWPORT, R. I., June 21, 1894.—Sealed proposals, in triplicate, for removing ledge rock in Pawtucket River, R. I., will be received here until 12 o'clock noon, July 31, 1894, and then opened. Attention of bidders is invited to Act of Congress approved Aug. 1, 1892, sections 1 and 2 (Public No. 129). Full information furnished on application. W. H. BIXBY, Cap. Corps of Engrs., U. S. A. 27-4t

TO WATER-WORKS CONTRACTORS

Sealed proposals will be received at the office of the Secretary of the Board of Water Commissioners of the corporation of Grafton, W. Va., until 12 o'clock noon, July 16, 1894, for furnishing all material and performing all labor necessary for the construction of a water-works plant for the above corporation.

The work to be done embraces the following:

Part 1. Furnishing cast iron pipe, about 430 tons.

Part 2. Furnishing valves and fire hydrants.

Part 3. Hauling and laying pipes and valves.

Part 4. Constructing steel tank.

Part 5. Furnishing two 1,000,000 gallon pumping engines.

Part 6. Furnishing boiler plant, 200 horse power.

Part 7. Constructing boiler and engine house.

The Water Commissioners reserve the right to reject any and all bids.

Plans and specifications can be seen and forms of proposals secured at the office of the Secretary, Grafton, W. Va., or at the office of the engineers, Westinghouse Building, Pittsburgh, Pa., after July 1, 1894.

By order of the Board of Water Commissioners.

B. F. BAILEY, Secretary.
WILKINS & DAVISON, Engineers. 26-3t

NOTICE TO CONTRACTORS.—Sealed proposals for constructing about six miles of pipe sewers in the village of Bridgeport, O., will be received by the Council at their office in said village until 12 o'clock at noon of July 12, 1894. Plans and profiles can be seen and specifications and form of contract obtained at the office of the Village Clerk. C. W. HOWELL, Village Clerk. 26-2t

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